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PhD thesis

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HOW IS ENCYCLOPAEDIA AUTHORITY ESTABLISHED?

Vanessa Aliniaina Rasoamampianina

Thesis presented for the Degree of Doctor of Philosophy

School of Education
College of Social Sciences
University of Glasgow

ABSTRACT

I embarked on this research because I wanted to explore the basis of textual authority. Such an understanding is particularly important in a world where there is such an overload of information that it is a challenge for the public to identify which publications to choose when looking for specific information. I decided to look at the case of encyclopaedias because of the widespread belief that encyclopaedias are the ultimate authorities. I also made the choice based on the observation that, besides the research on *Wikipedia*, the scientific community seems to overlook encyclopaedias, despite of the role these latter play as key sources of information for the general public.

Two theories are combined to serve as a framework for the thesis. On the one hand, there is the theory of cognitive authority as defined by Józef Maria Bocheński, Richard De George, and Patrick Wilson. On the other hand, there is the theory of quality as defined from the various frameworks recommended by librarians and information scientists on how to assess the quality of reference works. These two theoretical frameworks are used to deconstruct the concept of authority and to highlight aspects of authority which may be particularly worthy of investigation. In this thesis, studies were conducted on the following: (1) a literature review on the origin and evolution of encyclopaedia authority throughout the history of encyclopaedia, (2) a review of previous research pertaining to the quality and the authority of *Wikipedia*, (3) an analysis of the publishing and dissemination of science and technology encyclopaedias published in the 21st century throughout worldwide libraries, (4) a survey of perspective of encyclopaedia authors on the role of encyclopaedias in society and on the communication of scientific uncertainties and controversies, and (5) an analysis of book reviews towards a general assessment of encyclopaedia quality.

The thesis illustrates how a concept such as authority which is typically taken for granted can actually be more complex and more problematic than it appears, thereby challenging widespread beliefs in society. In particular, the thesis pinpoints potential contradictions regarding the importance of the author and the publishers in ensuring encyclopaedia authority. On a theoretical level, the thesis revisits the concept of cognitive authority and initiates a discussion on the complex interaction between authority and quality. On a more pragmatic level, the thesis contributes towards the creation of guidelines for encyclopaedia development. As an exploratory study, the thesis also identifies a range of areas which should be of priority for future research.

Keywords: encyclopaedia, encyclopaedia development, cognitive authority, quality, scientific uncertainty and controversies, library.

TABLE OF CONTENTS

<i>Abstract</i>	<i>i</i>
<i>Detailed table of contents</i>	<i>iii</i>
<i>List of appendices</i>	<i>ix</i>
<i>List of illustrations</i>	<i>x</i>
<i>List of acronyms and abbreviations</i>	<i>xii</i>
<i>Acknowledgements</i>	<i>xiii</i>
<i>Author's declaration</i>	<i>xiv</i>
Introduction	1
Chapter 1. Theory of cognitive authority	9
Chapter 2. Theory of quality	42
Chapter 3. Methodology	61
Chapter 4. Historical background on encyclopaedias	87
Chapter 5. Previous research on encyclopaedias: The case of <i>Wikipedia</i>	119
Chapter 6. Encyclopaedia industry	133
Chapter 7. Encyclopaedia dissemination	158
Chapter 8. Encyclopaedia development	174
Chapter 9. Encyclopaedia quality	205
Conclusion	232
<i>Appendices</i>	<i>241</i>
<i>References</i>	<i>294</i>

DETAILED TABLE OF CONTENTS

INTRODUCTION	1
The origin of the thesis.....	1
The main research question	2
The relevance of the thesis.....	3
The structure of the thesis	4
The metaphor used throughout the thesis	7
CHAPTER 1. THEORY OF COGNITIVE AUTHORITY	9
1. Introduction to cognitive authority	9
1.1. Definition from the literature on cognitive authority.....	11
1.2. Place within the concept of authority in general.....	14
1.2.a. Historical evolution.....	14
1.2.b. Modern classification	17
2. Role of cognitive authority	19
3. Cognitive authority in the case of individuals	21
3.1. Measures and limits of cognitive authority.....	21
3.1.a. Scope of authority.....	21
3.1.b. Degree, extent, intensity, weight of authority	23
3.1.c. Sphere of authority.....	23
3.2. Basis of cognitive authority	24
4. Cognitive authority in the case of texts	31
4.1. Measure of cognitive authority.....	33
4.1.a. Scope of authority.....	33
4.1.b. Degree, extent, intensity, and weight of authority	34
4.1.c. Sphere of authority.....	35
4.2. Basis of cognitive authority	36
5. Towards an understanding of encyclopaedia authority in general	40
CHAPTER 2. THEORY OF QUALITY	42
1. Introduction to quality and quality assessment	42
2. Librarian's approach to quality assessment.....	43

3. Librarians' expectations on the various parameters for quality assessment	45
Category 1. Importance within the publishing industry	45
Category 2. Encyclopaedia production	48
Category 3. Encyclopaedia content	49
Category 4. Information retrieval	54
Category 5. Encyclopaedia delivery	55
4. Towards and understanding of encyclopaedia authority in general	56
CHAPTER 3. METHODOLOGY	61
1. Research design	61
1.1. Studies contemplated	63
1.2. Studies completed	65
2. Description of contemporary encyclopaedias	66
2.1. Background information	67
2.2. Inventory of the contemporary encyclopaedias	67
2.2.a. Selection of the unit of analysis	68
2.2.b. Data collection and data handling	69
2.2.c. Data analysis	70
3. Exploration of encyclopaedia authority	71
3.1. Study of encyclopaedia dissemination	71
3.1.a. Research questions	71
3.1.b. Selection of the unit of analysis	71
3.1.c. Data collection	72
3.1.d. Data analysis	72
3.1.e. Limits of the methodology	74
3.2. Study of encyclopaedia development	74
3.2.a. Pilot study	75
3.2.b. Research questions	76
3.2.c. Selection of the unit of analysis	76
3.2.d. Data collection	77
3.2.e. Data analysis	79
3.2.f. Limits of the methodology	80

3.3. Study of encyclopaedia quality	81
3.3.a. Research questions	81
3.3.b. Selection of the unit of analysis.....	82
3.3.c. Data collection.....	82
3.3.d. Data analysis	82
3.3.e. Limits of the methodology	83
4. Ethical considerations.....	83
5. Approach to the writing.....	85
CHAPTER 4. HISTORICAL BACKGROUND ON ENCYCLOPAEDIAS.....	87
1. Introduction to encyclopaedias	87
1.1. Origin of the term.....	87
1.2. Early encyclopaedic compilations.....	88
1.3. Standards in modern encyclopaedias.....	89
2. Encyclopaedia inventory since the 5 th century BCE.....	91
2.1. Encyclopaedias in Europe	93
2.2. Encyclopaedias in England and Scotland.....	93
2.3. Encyclopaedias outside Europe	96
3. Encyclopaedia evolution since the 5 th century BCE.....	98
3.1. Evolution of the genre.....	98
3.1.a. Format and type of content	98
3.1.b. Nature of knowledge	100
3.1.c. Content arrangement	106
3.2. Evolution of the development process.....	107
3.2.a. Content development.....	107
3.2.b. Quality assurance	107
3.2.c. Content update.....	109
4. Roles of encyclopaedias in society	110
5. Towards an understanding of encyclopaedia authority in general	115
CHAPTER 5. PREVIOUS RESEARCH ON ENCYCLOPAEDIAS: THE CASE OF WIKIPEDIA	119
1. Introduction to <i>Wikipedia</i>	120
2. Research on the public use of <i>Wikipedia</i>	121
3. Research on <i>Wikipedia</i> quality.....	124

4. Research on <i>Wikipedia</i> authority	126
4.1. Authority of the contributors.....	126
4.2. Authority of the encyclopaedia in general.....	129
5. Towards an understanding of encyclopaedia authority in general	131
CHAPTER 6. ENCYCLOPAEDIA INDUSTRY	133
1. Introduction to modern encyclopaedias	133
1.1. Development of encyclopaedias.....	134
1.2. Place of encyclopaedias in libraries.....	137
1.2.a. Encyclopaedia acquisition.....	137
1.2.b. Encyclopaedia use.....	138
2. English language encyclopaedias: Previous inventories for the 20 th and early 21 st centuries	139
3. English language encyclopaedias: Systematic inventory for the 20 th and early 21 st centuries.....	140
3.1. Counting of library records.....	141
3.2. Description of library records	143
3.2.a. Format of publication	143
3.2.b. Year of publication	145
3.2.c. Country of publication and publisher.....	149
3.2.d. Topic coverage	153
4. English language encyclopaedias: Predictions for the rest of 21 st century	155
CHAPTER 7. ENCYCLOPAEDIA DISSEMINATION	158
1. Introduction to the study	159
1.1. OCLC institutions and their library catalogues.....	159
1.2. Science and technology encyclopaedias in library catalogues	159
2. Science and technology encyclopaedias: Dissemination pattern in general.....	162
2.1. Dissemination in individual OCLC institutions.....	164
2.2. Dissemination in all OCLC institutions.....	165
2.3. Factors influencing the level of dissemination	166
2.3.a. Format of publication	166
2.3.b. Year of publication	166
2.3.c. Country of publication and publisher.....	167
2.3.d. Topic coverage	168

3. Science and technology encyclopaedias: Dissemination pattern of the most popular titles.....	169
3.1. Dissemination in all OCLC institutions.....	169
3.2. Factors influencing the level of dissemination	170
4. Towards an understanding of encyclopaedia authority in general	172
CHAPTER 8. ENCYCLOPAEDIA DEVELOPMENT	174
1. Introduction to the study	175
1.1. Encyclopaedias targeted in the study	175
The Encyclopaedia of Global Warming and Climate Change	176
The Oxford Companion to Global Change	176
The Encyclopaedia of Earth.....	177
Encyclopaedia Britannica.....	179
Wikipedia	179
1.2. Authors participating in the study.....	180
1.3. Articles considered in the study	185
2. Authors' experience of encyclopaedia development.....	187
2.1. Understanding of encyclopaedias.....	187
What are encyclopaedias?.....	187
How to present scientific knowledge inside encyclopaedias?	188
What to achieve through the encyclopaedia articles?	190
2.2. Approach to the communication of scientific uncertainties and controversies	194
2.2.a. Stages in the writing process	194
2.2.b. Strategies for the communication of scientific uncertainties and controversies.....	194
How to choose the uncertainties and controversies to cover	195
What to do with the uncertain and controversial aspects	197
How to write the sections with uncertainties and controversies	199
2.2.c. Factors influencing the communication of scientific uncertainties and controversies	200
3. Towards an understanding of encyclopaedia authority in general	202
CHAPTER 9. ENCYCLOPAEDIA QUALITY	205
1. Introduction to the study	205
1.1. Book reviews	205
1.2. Book reviewers.....	206
1.3. Science and Technology encyclopaedias reviewed	208

2. Reviewers' approach to quality assessment.....	209
2.1. Challenges encountered.....	209
2.2. Use of the various parameters for quality assessment.....	211
3. Reviewers' verdict on the quality of science and technology encyclopaedias.....	215
3.1. Comments made on the various parameters.....	215
3.2. Comments made on the encyclopaedias.....	217
3.3. Quality of the science and technology encyclopaedias recommended by reviewers.....	219
3.4. Quality of the science and technology encyclopaedias not recommended by reviewers.....	220
3.4.a. The <i>Encyclopedia of Global Environmental Change</i>	220
3.4.b. The <i>Encyclopaedia of Animal Behaviour</i>	221
3.4.c. The <i>Chemical Engineer's Condensed Encyclopedia of Process Equipment</i>	223
4. Link between quality assessment and final verdict.....	225
5. Towards an understanding of encyclopaedia authority in general.....	228
CONCLUSION.....	232
Reflections on the theoretical framework.....	232
Reflections on the methodological framework.....	234
Response to the research question from the thesis chapters.....	236
Response to the research question from the thesis in general.....	237
Findings beyond the research question.....	238
Limits of the thesis and recommendations for future investigations.....	239
APPENDICES.....	241
REFERENCES.....	294

LIST OF APPENDICES

Appendix1. Materials emailed to encyclopaedia authors for the survey	242
Appendix2. Examples of guidelines for encyclopaedias	244
Appendix3. Detailed comments made by book reviewers	249
Appendix4. List of book reviews considered for Chapter 9	290

LIST OF ILLUSTRATIONS

Figures

Figure 1. Justifying the choice of a particular individual as cognitive authority	25
Figure 2. Justifying the choice of a particular text as cognitive authority	36
Figure 3. Occurrence of authority within the framework for quality assessment	58
Figure 4. Perspectives contemplated for the study encyclopaedia authority	62
Figure 5. Perspectives chosen for the study of encyclopaedia authority	65
Figure 6. Screenshot of the search page of WorldCat	69
Figure 7. Screenshot of the data provided for one example of library record within WorldCat.....	73
Figure 8. Coding process for the data from the survey questionnaires.....	80
Figure 9. Screenshot of the search page of ScienceDirect.....	83
Figure 10. Encyclopaedias developed in various parts of the world	92
Figure 11. Audience demographics for <i>Wikipedia.org</i>	122
Figure 12. Basis of the authority of <i>Wikipedia</i> contributors	127
Figure 13. Basis of the authority of <i>Wikipedia</i> in general	130
Figure 14. English language encyclopaedias listed in library catalogues	142
Figure 15. English language non-fiction books listed in library catalogues	142
Figure 16. Encyclopaedic content available as computer files and listed in library catalogues.....	146
Figure 17. Encyclopaedic content available online and listed in library catalogues	146
Figure 18. Encyclopaedic content available as support materials and listed in library catalogues...	148
Figure 19. Comparison between library records and unique titles listed in library catalogues	149
Figure 20. Origin of English language encyclopaedias printed since 1900	152
Figure 21. Topic coverage of English language encyclopaedias printed since 1900	154
Figure 22. Topic coverage for English language encyclopaedias printed since 1900	155
Figure 23. Science and technology encyclopaedias published since 2000	161
Figure 24. Topic coverage of science and technology encyclopaedias published since 2000.....	161
Figure 25. Dissemination of science and technology encyclopaedias published since 2000.....	165
Figure 26. Dissemination of popular and less popular science and technology encyclopaedias	170
Figure 27. Authors' involvement with the topic of their article	184
Figure 28. Authors' views on the nature of scientific knowledge.....	189
Figure 29. Authors' views on the nature of encyclopaedic knowledge.....	189
Figure 30. Authors' views on presenting scientific knowledge within encyclopaedias	190
Figure 31. Authors' approach to the writing of encyclopaedia articles	195
Figure 32. Reviewers' approach to quality assessment.....	210

Figure 33. Types of comment made by the reviewers	216
Figure 34. Recommendations regarding science and technology encyclopaedias.....	217
Figure 35. Recommendations with mixed and negative comments made by the reviewers	226
Figure 36. Recommendations with various types of comment made by the reviewers.....	227
Figure 37. Occurrence of authority within quality assessment in book review	230

Maps

Map 1. Origin of English language encyclopaedias printed since 1900	150
Map 2. Dissemination of science and technology encyclopaedias published since 2000	163
Map 3. Origin of the authors of encyclopaedia articles on global warming and climate change	186

Tables

Table 1. List of publications with a comprehensive framework for quality assessment.....	44
Table 2. Evolution of <i>Encyclopaedia Britannica</i> from the 1 st to the 15 th edition.....	97
Table 3. Comparison between Aristotle's and Pliny the Elder's organisation of knowledge.....	103
Table 4. Formats of English language encyclopaedias.....	143
Table 5. Number of science and technology encyclopaedias per type of institution	164
Table 6. Dissemination of science and technology encyclopaedias per format of publication	166
Table 7. Dissemination of science and technology encyclopaedias per country of publication.....	167
Table 8. Dissemination of science and technology encyclopaedias per topic coverage	169
Table 9. Encyclopaedias, articles and authors considered in the study.....	183

LIST OF ACRONYMS AND ABBREVIATIONS USED

Acronyms

ALA	American Library Association
EIC	Environmental Information Coalition
NCEP	Network of Conservation Educators and Practitioners
NCSE	National Council for Science and the Environment
OCLC	Online Computer Library Center
OUP	Oxford University Press

Abbreviations

BCE	Before the Christian Era
CE	Christian Era
GW&CC	Global Warming and Climate Change
SC	Scientific Controversies
SU	Scientific Uncertainties
SU&C	Scientific Uncertainties and Controversies
UK	United Kingdom
USA	United States of America

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But this thesis would not have been possible without the numerous authors, editors and publishers from all over the world who kindly shared their experience of writing and publishing encyclopaedias; so I want to start here by expressing my appreciation to them. I am equally obliged to the individuals who discussed the development of information quality during the pilot study. I am also thankful to the assistance of the Lending Service and the Subscription Service staff for the information provided on the use of encyclopaedias within the University of Glasgow. A special thank goes particularly to the education subject librarian —Honor Hania— for her patience with my incessant queries.

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AUTHOR'S DECLARATION

I declare that this thesis does not include work forming part of a thesis presented successfully for another degree. Thesis represents my own work except where referenced to others.

Name: Vanessa Aliniaina Rasoamampianina

Date: 31st May 2012

Reg.No: 0704022r

Place: University of Glasgow

INTRODUCTION

The origin of the thesis

This PhD is a personal journey. It sprang from a desire to make a change that I felt for many years when I was still in Madagascar. Back then, I was working for the Network of Conservation Educators and Practitioners (NCEP) –a project which was initiated by the American Museum of Natural History and which was launched in Madagascar in 2003 with the collaboration of various local governmental and non-governmental agencies as well as higher education institutions. NCEP aims at improving the training of the current and future Malagasy conservation practitioners by providing training materials specifically adapted to the context and needs of the country. Within the project, my role was to coordinate the development of NCEP teaching and training materials: to commission authors and editors, to hold series of content development workshops with panels of experts and local stakeholders, to send the materials for peer review, and to edit the materials for print, electronic and online publication. While piloting the use of NCEP materials in various settings, I noticed that, although the Malagasy teachers and trainers freely praised the content and the ease of use of these materials, they seemed to prefer foreign textbooks and reference materials. Several reasons could have explained the situation. I, however, had the impression that the NCEP materials were simply not considered authoritative enough. Therefore, I was eager to look into whether anything could be done to change the situation.

When the University of Glasgow advertised a funded PhD to explore the issue of quality in *Wikipedia*, I decided to submit my application because of the close similarity between *Wikipedia's* longing to be recognised as an authoritative encyclopaedia on the Internet and the NCEP' yearning to have its materials adopted in Malagasy institutions. The fact that *Wikipedia* was primarily created

for reference but not for teaching did not deter me; quite the opposite. Like many people, I grew up believing that encyclopaedias were the ultimate authoritative materials. So, I imagined that any knowledge gathered in the course of this PhD would not only improve *Wikipedia* quality and authority but would similarly benefit other initiatives in the development of reference and educational materials, including the NCEP project.

This PhD project also appealed to me because of my continuous interest in encyclopaedias. I have fond memories of myself spending hours flicking through the copy of the *Tout l'Univers: Grande Encyclopédie de Culture Générale Entièrement Illustrée en Couleurs* (published by Hachette) that we had at home. Judging by the number of scribbles left in its pages, this encyclopaedia must have captured my attention from a very early age. Later on, going systematically through the pages of these volumes with my friends and “debating” our readings became one of my favourite activities. Once I reached university where I studied animal biology and conservation, the lack of textbooks made me particularly appreciate the value of encyclopaedias as source of background information. My lecturers did their best to develop hand-outs; yet their drawing of the octopus respiratory system or their description of the dugong –“a marine mammal with breasts like humans which contribute to the name Syrenians”– left a lot to my imagination. The fact that I could check materials such as the *Encyclopédie Universelle des Animaux* (published by Edito-Service) from the library where my mother worked as documentalist considerably helped me throughout my undergraduate studies. I realised that, although a PhD on encyclopaedias would move me away from my biology background, it would take me into a world which has always fascinated me anyway.

The main research question

Patrick Wilson, a prominent librarian, information scientist and philosopher, wrote in his book *Second-Hand Knowledge: An Inquiry into Cognitive Authority* (1983, pp.9-10):

Experience teaches but not much.... If all we could know of the world was what we could find on the basis of first-hand experience, we would know little... We mostly depend on others for ideas, as well as for information about things outside the range of direct

experience... Much of what we think about the world is what we have second-hand from others.

Wilson argues that, whenever we have questions, it is up to us to choose which of the available sources of information to consult for answers. Because of the influence that these sources can have on our knowledge and understanding of the world, they constitute what Wilson calls our “cognitive authorities”.

As much as knowledgeable individuals, published texts can be valuable cognitive authorities for us; yet, as far as I am aware, there has been no empirical research exploring how authority is established in these texts. The current thesis addresses this gap by looking at the concept of textual authority and by focusing on the case of the most authoritative publications: encyclopaedias (Collison 1964, Kister 1986, Katz 1992). The main research question addressed throughout the thesis is: How is encyclopaedia authority established?

The relevance of the thesis

This thesis would be valuable to a range of people, including the public in general and encyclopaedia developers in particular. After all, the public have always favoured encyclopaedias when choosing texts for cognitive authority (Wilson 1983). In fact, the adage “if it is written, it must be true” rings with stronger resonance when applied to encyclopaedias than to any other written material. At a time when various types of authority are questioned in society, it is important to know to which extent the widespread belief in encyclopaedia authority is still legitimate. In fact, encyclopaedia developers also probably want to ensure that the reputation of encyclopaedia as authoritative materials remains intact.

This thesis also opens up the way for future research. So far, the scientific community has shown little interest in questioning encyclopaedia authority – except in the case of *Wikipedia*, the most used online encyclopaedia in the 21st century. This thesis demonstrates that there are matters in need of both theoretical and empirical investigations in traditional encyclopaedias.

The structure of the thesis

The thesis is a case study of contemporary encyclopaedias, and more precisely, an exploratory study of the authority of the 21st century ones. Throughout the thesis, the concept of authority is deconstructed into its basic components which are then applied to the case of encyclopaedias. Within the confines of the time and resources available for the PhD, the authority of 21st century encyclopaedias was mostly studied from three perspectives:

- From the encyclopaedia dissemination through various libraries which reflects the librarians' choices of encyclopaedias and their perceptions of encyclopaedia authority;
- From the authors' experience of encyclopaedia development in order to explore existing understanding of encyclopaedia standards and ongoing efforts towards maintaining encyclopaedia authority; and
- From the reviewers' assessment of encyclopaedia as a way to further explore the link between quality and authority.

A mix of quantitative and qualitative methods was used throughout the thesis.

Besides this brief Introduction and the Conclusion at the end of the thesis, there are nine main chapters. The thesis starts with two chapters which introduce the two theoretical frameworks considered –namely, the theory of cognitive authority and the theory of quality respectively. The chapter which discusses the methodological framework comes next, followed by two chapters providing background information on the world of encyclopaedias and on past research on *Wikipedia*. Finally, there is a large part of the thesis which is dedicated to the various empirical studies that I conducted on the dissemination, development and quality of other encyclopaedias.

A preamble to the various chapters is provided below.

- **Chapter 1** introduces the various theories on cognitive authority. The chapter not only defines the place of the concept of cognitive authority within the general concept of authority but also describes its basic tenets according to the writings of Patrick Wilson, and that of his predecessors Józef Maria Bocheński and Richard De George. The chapter then discusses the implications of the theories of cognitive authority for the conduct of

the current thesis, including the need to take into consideration the issue of information quality.

- **Chapter 2** follows up by defining a framework for quality assessment from existing guidelines on reference materials and encyclopaedias. Further discussion on the relationship between the concept of authority and that of quality is provided. The writings of librarians and information scientists from the American Library Association such as William Katz or Kenneth Kister are given prominence in the chapter.
- **Chapter 3** then introduces the thesis methodology. The planning stage of the research is revealed before the final design of the case study research is described. The details of the data collection and data analysis for the studies conducted in the course of the thesis are covered at length. Finally, the approach to potential ethical issues is discussed, followed by a brief note on the approach to the writing of the thesis findings.
- **Chapter 4** is a historical overview of the world of encyclopaedias. The chapter is largely based on Robert Collison's book *Encyclopaedias: Their History Throughout the Ages* (1964). The chapter starts with a brief overview of the most notable encyclopaedic efforts in various parts of the world from 5th century BCE until the mid-20th century CE. The chapter then reviews the evolution of the encyclopaedia development and the role played by encyclopaedias in society. The chapter ends with some reflections based on the theory of cognitive authority in an attempt to understand the origin of encyclopaedia authority.
- **Chapter 5** reviews previous research on encyclopaedias and focuses particularly on the case of *Wikipedia*, which is the encyclopaedia most studied by scientists and which is at the heart of heated debate regarding its authority. The chapter illustrates how the theory of cognitive authority and information quality has been used in previous research. The chapter also summarises the findings on *Wikipedia* quality and authority.
- **Chapter 6** focuses on modern encyclopaedias and starts by describing the challenges faced by the industry. The chapter then provides a systematic inventory and description of English language encyclopaedias published from the beginning of the 20th century to the first decade of the 21st century and held in institutions which are member of the Online Computer Library Center (OCLC). The inventory is based on the analysis of 176,211

library records from WorldCat, which is the largest bibliographic database in the world and the property of OCLC. Predictions regarding the status of encyclopaedias in the 21st century are also provided.

- Following-up directly from Chapter 6, **Chapter 7** focuses on science and technology encyclopaedias and examines the dissemination of 396 titles published between the years 2000 and 2009 within 5,429 OCLC institutions in 59 countries. Taking encyclopaedia dissemination as an indication of authority, the chapter then tries to identify factors which could potentially have an influence on encyclopaedia authority.
- **Chapter 8** addresses the issue of encyclopaedia authority from the perspective of encyclopaedia authors. More specifically, the chapter looks at the process of content development: the objective of the author for writing encyclopaedia articles, the nature of encyclopaedic knowledge, and the approach to the communication of science in the case of controversial topics such as the global warming and climate change. 75 authors who contributed to five encyclopaedias published in the year 2008 participated in an email survey. The chapter tries not only to determine the extent to which establishing the authoritativeness of encyclopaedia articles is a concern for encyclopaedia authors but also to explore some of the writing strategies used by them.
- The last empirical study conducted for the thesis is summarised in **Chapter 9**. This is a quality assessment of 66 science and technology encyclopaedias as reported in 80 reviews published in the widely used ScienceDirect database. The chapter starts with the reviewers' expectations and illustrates the extent to which the theories on quality assessment as seen in Chapter 2 were applied by the reviewers. The chapter then summarises the reviewers' verdicts regarding the achievements and shortcomings of the encyclopaedias. The chapter ends by analysing the impact of quality assessment on the reviewers' final recommendations to potential buyers and, consequently, on the general perception of encyclopaedia authority.

In the **Conclusion** section at the end of the thesis, some reflections on the theoretical and methodological frameworks are provided, along with a summary of the key findings. Ancillary findings beyond the thesis main research questions are also covered. A brief concluding remark spells out the "take home"

messages, highlights the importance of the thesis findings and opens up the door for future studies, which, I am hoping that I –and other researchers– will carry on in the future.

It should be noted that the chapters in this thesis can be read independently of one another. The findings from each chapter are discussed in a section labelled “Towards an understanding of encyclopaedia authority in general” at the end of the chapter rather than grouped in a separate Discussion Chapter. Also, these chapters are not ordered chronologically. For instance, the study of encyclopaedia industry (Chapter 6) and the study of encyclopaedia dissemination (Chapter 7) were conducted between 2010 and 2011 whereas the study of encyclopaedia development in Chapter 8 was conducted a year earlier. Also, some of the chapters could have been situated in other places. In particular, Chapter 4 on the history of encyclopaedias and Chapter 5 on previous research on *Wikipedia* could have equally been appropriate situated right after this introductory section because they both provide important background to the thesis. In fact, deciding on the structure of the thesis was particularly challenging because of the number and diversity of the topics covered. The final structure was adopted because I believe it is easier for the reader to move from one chapter to the next if all literature reviews –which covers theoretical, methodological and background information on encyclopaedias– are grouped together and presented before the empirical studies on encyclopaedia authority and quality.

The metaphor used throughout the thesis

Considering the richness and complexity of the thesis, the use of a metaphor could make the structure of the information presented more apparent (Carpenter 2008). It then occurred to me that the process followed throughout the thesis is very similar to the process of building a kaleidoscope, which – according to the *Oxford Advanced Learner’s Dictionary* (1997)– is defined as:

1. a toy consisting of a tube that you look through with loose pieces of coloured glass and mirrors at the end. When the tube is turned, the pieces of glass move and form different patterns.
2. a situation, pattern, etc. containing a lot of different parts that are always changing.

The physics underpinning the kaleidoscope –the toy that I was building– is optics. Light first enters one end of the tube and filters through the loose pieces of coloured glass which are installed there. The light is then reflected by the mirrors aligned along the inner walls of the tube. A viewer at the other end of the tube would see the reflection of the light throughout the tube as a pattern. In the context of this thesis, the ray of light which makes the experience possible is the research question that I had to keep in mind. The coloured pieces of glass are the various studies conducted, the mirrors are the theoretical frameworks, and the patterns appearing at the end of the tube are the research findings. The steps that I took to build my kaleidoscope are listed below:

- I selected two mirrors to use for my kaleidoscope. These are the theory of cognitive authority and the theory of quality which I refer to throughout the entire thesis.
- I recycled two pieces of glass which I got from an old kaleidoscope and tested how they would work in my new kaleidoscope. These are the literature reviews whereby I revisited the historical evolution of encyclopaedias and the previous research on *Wikipedia* in order to extract any information pertinent to encyclopaedia authority.
- I selected three new pieces of glass and studied the pattern each of them would create in a kaleidoscope. Here I investigated encyclopaedia authority by conducting three new empirical studies: the first on encyclopaedia dissemination, the second on encyclopaedia development and the last on encyclopaedia quality.
- I finally combined the various components of my kaleidoscope together and let light through the device to discover the final pattern. This final step is where I reflected on the whole research and tried to come up with a final answer to my research question.

There is a strong parallel between the process described above and the thesis structure.

In order to encourage the reader focus on the data presented, there is little mention of the metaphor of the kaleidoscope throughout the thesis. The only exception is in the Methodology Chapter and the Conclusion section where the metaphor is revisited and heavily used to reflect on the thesis findings.

CHAPTER 1.

THEORY OF COGNITIVE AUTHORITY

As mentioned in the Introduction Section of this thesis, reference materials such as encyclopaedias are often the first texts that people consult in their search for answers to their everyday questions. Patrick Wilson himself (1983, p.81) writes that “reference books in large number are granted cognitive authority”. It is therefore unsurprising that, in the attempt to explore the authority of encyclopaedias, the first chapter of this thesis investigates the concept of cognitive authority, which is also known as “epistemic authority” according to Józef Maria Bocheński, and Richard De George. For the sake of consistency, I am using the term “cognitive authority” throughout the current thesis.

This chapter starts by defining cognitive authority before situating it within the wider concept of authority. The chapter then summarises the basic tenets of cognitive authority in general before discussing the particular case of published texts such as reference materials. In fact, the literature on cognitive authority mostly focuses on the case of individuals as cognitive authorities and dedicates less attention to the cognitive authority of published texts. My ultimate goal here is to address this oversight and initiate the discussion around the cognitive authority of reference materials, including encyclopaedias.

1. Introduction to cognitive authority

In non-specialist terms, a cognitive authority is simply an individual or an institution considered as “an authority” on a particular subject, as opposed to an

individual or an institution “in authority” within a particular community (Peters *et al.* 1958, Young 1974, Green 1998).¹

In the literature, it is Patrick Wilson who introduces the term “cognitive authority” in his *Second-Hand Knowledge: An Inquiry into Cognitive Authority* (1983) –a seminal book which continues to be widely used in the field of library and information science. But Wilson himself overtly acknowledges that the concept of cognitive authority is based on the concept of epistemic authority which was defined by Józef Maria Bocheński and Richard De George. Bocheński is a logician who studies, among many other topics, the concept of authority. Bocheński mentions epistemic [cognitive] authority in many of his publications (Bocheński 1963, 1965a, 1965b, 1989) and discusses it more thoroughly in his book *Was ist Autorität? Einführung in die Logik der Autorität* (published in 1974, later translated into French by Secretan in 1979). De George is a philosopher who studies political and moral authorities. He, however, dedicates a couple of papers to epistemic [cognitive] authority (De George 1970, 1976) and he has one chapter entitled “The authority of knowledge and competence” in his book *The Nature and Limits of Authority* (1985).

There are many empirical studies which are using cognitive or epistemic authority as theoretical framework; for example, the study of information quality and credibility (e.g. Olaisen 1990, Fritch and Cromwell 2001, Rieh 2002, 2005, 2010, Savolainen 2007), the study of information behaviour (e.g. McKenzie 2003, Zach 2004, Hughes *et al.* 2010) and other citation studies (e.g. Moed and Garfield 2004, Meho and Yang 2007). These studies, however, do not offer complementary information on the basic tenets of the theory of cognitive authority. Additionally, there are studies which are simply mentioning cognitive or epistemic authority without any explanation or discussion of the theory, particularly the studies focusing on knowledge production and transfer or those studying the perception and use of knowledge. Such is also the case of studies with theoretical debates around the nature of experience and expertise (Walton 1997, Iranzo 2009), the authority of research institutions (Pierce 1991) and

¹ Young suggests a third expression –“on authority”– to indicate the authority of leadership; i.e. someone “on authority” is someone in a specific position within an organisation or within a hierarchy. The expression “on authority” is, therefore, very close to the expression “in authority”.

educational ones (e.g. Peters 1965, Edgerton 1968, Chambers 1979). Yet, the link with the theory of cognitive [epistemic] authority is often either weak or indirect. None of these studies are discussed in the current thesis.

In the rest of this chapter, the concept of cognitive authority is discussed according to the work of these three theorists, in chronological order. In general, their views on cognitive or epistemic authorities share many similarities but do not totally overlap as explained hereafter.

1.1. Definition from the literature on cognitive authority

From the work of Bocheński

As a logician, Bocheński is particularly interested in teasing out the nature of authority. Starting in his 1963 paper (p.45), he introduces the triadic nature of authority which he describes as the relationship between three entities: 1) the bearer of authority, 2) the subject of authority, and 3) the field of authority. It is from further analysis of this third entity that Bocheński distinguishes the concept of epistemic [cognitive] authority from the concept of deontic authority as explained in the quote below:

A field of authority is two-fold: it is either a class of *propositions* which states *what is*, or a class of *rules*, prescribing what *should be done* (...) If the field is a class of propositions, then the authority is that of one who knows better, i.e. of the expert in the field. This sort of authority will be called “epistemic [cognitive] authority”. If, on the other hand, the field is a class of rules, the authority is that of a superior, a leader, a commander, etc. and we will be called “deontic authority” (Bocheński 1965b, p.167 - emphasis in the original document).

Bocheński’s views on authority have remained fairly unchanged despite some variations in the wording and some more precision over time –whether the views concern the triadic nature of authority (Bocheński 1965a, p.57, 1989, p.61), the comparison between deontic and epistemic [cognitive] authority (Bocheński 1965a, pp.70-71, 1989, p.62) or the definition of epistemic [cognitive] authority and its field (Bocheński 1965a, p.73, 1989, p.62).

From the work of De George

De George generally aligns with Bocheński's views. For instance, he talks about the triadic nature of authority in a comparable manner and uses a similar language (De George 1976, p.77). He also contrasts deontic authority with epistemic [cognitive] authority and defines the first as some sort of "performatory" authority with the power to rule or to command others and the second as a "declarative-emotive" authority without such a power (De George 1976, pp.78-79). In fact, epistemic [cognitive] authority is further described as "a non-executive authority (...) in the field of knowledge" (De George 1985, p.22).

Concerned about society's rejection of authority, De George strives towards finding ways to characterise and legitimise authority and dedicates a lot of effort to describe what is meant by "superior knowledge" as grounds for epistemic [cognitive] authority. De George (1970, p.200) claims that the bearer of authority needs to have "considerably more knowledge" than the subject of authority (see also De George 1976, p.78, 1985, pp.26-27). Moreover, he posits that there are some kinds of knowledge which are more valuable than others (De George 1985, pp.32-33), whereby implying that only individuals and institutions with such kind of knowledge are legitimate epistemic [cognitive] authority. By comparison, Bocheński is more lenient, particularly when he claims that "everyone is an authority in at least one field for everyone else" and cites the case of a child who knows more than anyone else about pains he feels in his stomach (Bocheński 1965a, p.67). On that last case, De George writes

We do not usually say that each person is an authority on his own feelings and private thoughts. But if someone were to use the term 'an authority' to refer to each person whose statements about himself, his feelings, or his thoughts are believed by [someone else], no harm would be done (De George 1985, p.32).

To push the argument further, De Georges (1976, p.81) specifies that someone who has lived through an event is mostly a witness and does not necessarily deserve to be called an authority on the event in question.

Another feature distinguishing De George from the other two theorists is his diligence in making the distinction between *de facto* authority on the one hand,

and “legitimate” or “grounded” authority on the other hand. For instance, in his book *The Nature and Limits of Authority*, he writes about *de facto* authority:

X is a *de facto* epistemic [cognitive] authority if there is some Y who considers X an authority for Y in some realm (R). With respect to that realm, Y considers X his superior in knowledge (De George 1985, p.27; with X and Y being the bearer and the subject of authority respectively).

and about “legitimate” or “grounded” authority:

To ask whether X’s epistemic [cognitive] authority is grounded is to ask under what conditions it is reasonable for Y to believe what X says (De George 1985, p.35).

There are contentions between the two forms of authority, as explained below:

No matter how authoritatively X may speak, or legitimate an authority he may be, he does not have *de facto* authority unless his utterances are believed. Conversely, X may be a *de facto* epistemic [cognitive] authority for Y, though in fact X is not a legitimate authority, and there are no good reasons for Y to believe what X asserts (De George 1976, p.80).

De George suggests various strategies to help individuals identify legitimate authority as summarised in p.27 of the current chapter.

From the work of Wilson

When Wilson revises the concept of epistemic authority in 1983, not only he uses little of the logic-based language used by his predecessors and introduces “cognitive authority” as a new name for the concept, but he also studies the concept from a new perspective. Probably because of his profession, Wilson particularly focuses on the perspective of the subject of authority –the members of the public who have limited knowledge of their own but who struggle to decide which individuals to approach or which book to check for answers to their questions. For instance, the first time Wilson defines cognitive authority in his book, he refers to the challenge that the members of the public face and writes:

All I know of the world beyond the narrow range of my own personal experience is what others have told me. It is all hearsay. But I do not count all hearsay as equally reliable. Some people know what they are talking about, others do not. Those who do are my cognitive authority (Wilson 1983, p.13).

Wilson then endeavours to provide a greater understanding of how the members of the public go about choosing authoritative sources of knowledge. Wilson indicates that, although there are many individuals and institutions which provide information and knowledge and which successfully achieve influence over others, these individuals and institutions cannot be called “cognitive authority” unless they had been actively sought after for insights and their influence had been “consciously recognised as proper” (Wilson 1983, p.15). It is indeed possible to influence others without being recognised as a proper cognitive authority and Wilson cites the case of advertisements to illustrate his point.

1.2. Place within the concept of authority in general

1.2.a. Historical evolution

The concept of cognitive authority has always been embedded within the general concept of authority. Indeed, a form of influence –as seen in the case of cognitive authority– existed from the origin of the concept of authority, back in the Antique Rome. The term “authority” has its roots in the Latin nouns *auctor* and *auctoritas* (Peters *et al.* 1958). According to Latin-English dictionaries (e.g. Smith 1866, Smith and Lockwood 2001, Glare 2004), *auctor* refers to a progenitor or a founder (as of a family or a city) as well as to an author (as of a work of art, a book or a policy). According to the same dictionaries, *auctoritas* refers to a variety of activities or properties of the *auctor*, including –among other things²– the *auctor*’s leadership and responsibility in action, the *auctor*’s weight, prestige and authority, as well as the influence, advice and guidance that the *auctor* provides. At that time, individuals with *auctoritas* were typically perceived as having some form of superiority, moral characteristics or prestige which deserved deference (Laird 1933-1934, Krieger 1973). Individuals with *auctoritas* such as parents, old people, wisemen, augurs and priests (but also knowledge and science) were highly sought for counselling, approval, or warning

² Other properties of the *auctor* are:
- the capacity to give permission to act;
- the capacity to serve as a guarantee or a security.

(Watt 1982). In all cases, it is this superior knowledge and capacity to advise and guide others that is most pertinent to the concept of cognitive authority.

Rapidly, however, the idea of power and control –an extreme form of deontic authority– emerged. Many researchers (e.g. Heinze 1925, Wirszubski 1960, Watt 1982) indicate that, with the evolution of the form of government in the Ancient Rome, the concept of *auctoritas* became mixed with the concept of *potestas* which means power and control (e.g. Smith 1866, Smith and Lockwood 2001, Glare 2004). In fact, originally, the Roman consuls and the Senate provided advisory support while the magistrates, the military and civil officials exercised the legal and executive power. Then under the Imperial Rome, Augustus (63 BCE - 14 CE) and other consecutive emperors started to combine *auctoritas* and *potestas* in their hands, thereby blurring the distinction between the two.

By comparison, the apparition of the concept of cognitive authority followed a different path in Ancient Greece. There, the concept of authority started with strong ideas of power already embedded within, as a researcher explains:

there is no word to translate *auctoritas* [...] and perhaps, more debatably, that even the idea of weighty counsel, ‘more than advice and less than command’, is not to be found there either, at least in the Greek political practice, which knew command and coercion of subordinates, and persuasion of equals, but not *auctoritas* (Watt 1982, p.14).

That was the situation until some of the Greek philosophers such as Plato (428-384 BCE) and Aristotle (384-322 BCE) sought to move the Greek governance away from the tyrannical model of command and coercion. Plato, in particular, tried to impose the authority of reason through –what he called– “the philosopher-king”. Plato’s argument was that it is possible to govern not by the violence of the rulers but by the sagacity, wisdom or expert knowledge of the philosophers (Laird 1933-1934, Taylor 1960, Imbert *et al.* 1997). Aristotle argued further that, even among individuals of equal status, one may be more authoritative than the others in virtue of some received education and training (Arendt 1954). When Plato and Aristotle championed reason and knowledge as legitimate sources of authority, it can be suggested that the concept of cognitive authority was embedded in their arguments.

As the concept of authority evolved over time (Arendt 1954, Krieger 1973, 1977), the concept of cognitive authority continued to be present. It, however, had minor importance and was often overlooked, particularly in Western societies. In fact, the terms “authority”, “power” and “domination” were often used interchangeably (Kim 1966, Sennett 1980). Since the rise of fascism, communism and other totalitarian forms of government in the early 20th century, the spotlight has particularly been on political authority (e.g. Benn 1967, Green 1998, Christiano 2008), especially its tyrannical forms (Arendt 1956). Even outside the political realm, the debate around authority has often focused on the authoritarian relationships within society –as in the case of authoritative parents and authoritative educators (Collier 1957, Kaplan 1970, Terris 1970, Adams 1976).

Contemporary dictionaries mirror the limited attention allocated to cognitive authority. Indeed, dictionary entries on authority typically start by highlighting the idea of power and domination. For example, the entry from *The Oxford English Dictionary* (1989) begins with:

- I. Power to enforce obedience
 - 1.a. Power or right to enforce obedience; moral or legal supremacy; the right to command or give an ultimate decision.
 - 1.b. *in authority*: In a position of power, in possession of power over others.

Authority as a form of advisory support and intellectual influence –as is the case in cognitive authority– is usually relegated to a minor position. For example, the second part of the entry on authority from *The Oxford English Dictionary* (1989) reads:

- II. Power to influence action, opinion, belief.
 4. Power to influence the conduct and actions of others; personal or practical influence.
 5. Power over, or title to influence, the opinions of others; authoritative opinion, intellectual influence.
 6. Power to inspire belief, title to be believed; authoritative statement; weight of testimony.
Sometimes weakened to: authorship testimony.

Similarly, the *Webster's Third New International Dictionary of the English Language* (1986) identifies eight main dimensions of authority and lists under the third bullet point within the entry on authority:

- 3a. power to influence thought and opinion: intellectual influence
- 3b. power to influence the outward behaviour of others:
practical personal influence (the authority of fashion);

While intellectual influence is alluded only in the last sentence of the entry on authority within the *Collins Today's English Dictionary* (1995) which states:

If someone is an authority on a subject, they know a great deal about it.

1.2.b. Modern classification

As indicated several times within this chapter, cognitive or epistemic authority is only one among many other types of authority. For example, it is noted earlier that Bocheński contrasts cognitive authority with deontic authority. In fact, there are various approaches to the classification of authority. Some researchers classify authority based on the intention of the bearer of authority whereas other researchers consider the social context or the way in which authority is established.

Bocheński's classification of authority (1989) falls under the first approach – which based on the intention of the bearer of authority– as, for him, an “epistemic authority” is an individual who wants to communicate some propositions whereas a “deontic authority” is an individual who wishes to rule others. Similarly, Adams (1976) contrasts “epistemic authority” –defined as an individual who influences the thinking of others by telling them “know-what” in the form of propositions and statements– with “moral authority” –defined as an individual who makes others commit something by telling them “know-how” in the form of rules and commands.

The second classification of authority is based on the social context where the authority is exercised. De George (1985) and many other researchers (e.g. Kaplan 1970, Harris 1976) adopt this approach. For them, “epistemic authority” is the form of authority prevailing in the domain of intellect, science and knowledge in general. The other domains where authority is exercised are: the family and the local community, the political and legal sphere, the domain of religion and morality, and so on.

The third approach is based on the way in which authority is justified. Here, several classifications exist. For example, Goodwin (1998, 2001) assimilates “epistemic authority” with what he calls “expertise-based authority” and he opposes it with “command-based authority” or the authority based on the individual’s dignity. Another example is seen in Max Weber’s classification of authority. In this case, authority is mostly discussed in the context of sociology and political sciences and does not seem to recognise epistemic [or cognitive] authority (e.g. Weber 1947, 1961). Weber identifies only three forms of legitimate authority:

- 1) “Rational-legal authority” which is established by rules and laws;
- 2) “Traditional authority” which is established by long-established customs, habits, and social structures; and finally,
- 3) “Charismatic authority” which is established by “gift of grace” or character, strength, traits within the bearer of authority.

Weber’s focus is definitely on the authority to command. The knowledge necessary to make sensible commands, however, seems to be overlooked or taken for grant. In fact, some researchers (e.g. Peters *et al.* 1958, McIntosh 1970) suggest that the knowledge and expertise of an individual can be part of his or her “charismatic authority”. The same researchers add that some additional processes –such as the social or and institutional supports– are often required for the superior knowledge and expertise to be recognised and valued.

There is another classification which is also based on the justification of authority; one which contrasts *de facto* authority with *de jure* authority (e.g. Peters *et al.* 1958, Benn 1967, Green 1998). *De facto* authority –as already defined by De George earlier in this chapter³– refers to the actual or effective authority which often arises from practice or from tradition. By contrast, *de jure* authority is an imposed form of authority which is established by means of rules, rights, or permissions. Researchers report that the two forms of authority are not always mutually exclusive. In fact, there are cases where *de jure* authority emerges from *de facto* authority and vice versa. There are even cases where they coexist within the same individual or institution.

³ See also De George’s definition of *de facto* authority starting on p.12.

2. Role of cognitive authority

When Bocheński (1989, p.61) defines the bearers of authority as individuals who communicate statements with assertion, he seems to imply that these individuals who have knowledge automatically communicates it to others. But De George (1976, p.80, 1985, p.15) and Wilson (1983, p.22) both indicate that it is possible for individuals to keep their knowledge to themselves and not communicate it to others, as much as it is possible for the same individuals to communicate their knowledge but for their peers to contest this knowledge as valid. In these two cases, because the communication is defective, a potential cognitive authority fails to play the role mentioned in the previous paragraph.

But one point which seems overlooked by Bocheński, De George, and Wilson is the fact that the effort and desire to communicate something does not necessarily result in an effective communication. After all, it is not unusual that an individual with the highest level of expertise on a given topic struggles to convey his knowledge to individuals who are not familiar with the topic, or even to those who are working in the same area. A mere assertion of facts –or the communication of statements with assertion, as Bocheński (1989, p.61) puts it– is rarely enough to convince others about the value of a piece of knowledge. Conversely, there are individuals who are not the most knowledgeable on a topic but who end up being the most consulted because of their position and because of their communication skills and their mastery of the art of persuasion. I would thus argue that cognitive authorities are not only expected to communicate knowledge but to communicate it effectively. It is even possible that, in some cases, a certain degree of deontic authority (particularly the charismatic type) is necessary to reinforce the transfer of knowledge from the cognitive authorities to their audience.

Ultimately, the primary role played by cognitive authorities is the communication of knowledge. For instance, De George writes that the purpose of epistemic [cognitive] authority is “to substitute the knowledge of one person in a certain field for the lack of knowledge of another” (De George 1970, p.201). But in this process, cognitive authorities are expected to do more than communication of the facts and information which form current knowledge.

Cognitive authorities should not only influence the thinking of those subjected to their authority (Wilson 1983, p.14), they should also serve as “guide” and “source of advice” (De George 1970, p.201). Wilson (1983, pp.16-18) insists on the idea that cognitive authorities should be able to express informed opinions, which combine the interpretation of current knowledge and the formulation of predictions beyond what is already known. Practically, cognitive authorities should be able to:

- Indicate the state of knowledge on specific topic; i.e. tell whether the knowledge can be considered as correct –or at least widely accepted– or not;
- Answer questions never asked before, from the current state of knowledge;
- Assist in times of uncertainties and controversies; i.e. weight the various competing ideas, indicate which ideas can be taken into consideration and which ideas can be ignored, and suggest how to deal with the competing ideas.

I would like to insist on the fact that cognitive authorities do not operate at random or in a vacuum. The role played by the cognitive authority –namely the transfer of information, the guidance and counselling of other individuals– is valued only on two conditions. The first condition is that cognitive authority should directly respond to an active demand from the subject of authority. It is true that the public is influenced by the multitude of information which is bombarded to them. Yet, I would argue that the public can identify and consciously choose their cognitive authority only if they have actively searched for it in the first place. Wilson (1983, p.15) touches on this point when he indicates that not all entities influencing our thoughts are recognised as “proper” and when he cites the example of advertisements as inappropriate cognitive authority. The second condition is that cognitive authority should amply satisfy the needs of the subject of authority. After all, I doubt that the public would be granting the status of authority to anyone for a knowledge which is perceived as deficient, substandard or plain wrong. This goes back to what counts as superior and valuable knowledge as defined by De George (e.g. 1970, p.200, 1976, p.78, 1985, p.32-33).

3. Cognitive authority in the case of individuals

When Bocheński, De George and Wilson write about cognitive authority, they primarily focus on individuals and –by extension– on groups of individuals such as in institutional bodies. Before any analysis of the cognitive authority of reference materials such as encyclopaedias is possible, a review of the cognitive authority of these individuals is, therefore, necessary. Many of the tenets of cognitive authority have already been mentioned in earlier sections of this thesis. But, so far, nothing has been said regarding the process whereby we actually measure or choose and justify our cognitive authorities. The very reason for us to seek information and knowledge from other individuals is because we cannot answer some of the questions in a specific field. This means that we have limited capacity to directly test the superiority of someone else’s knowledge in the same field. We need to find various grounds in addition to our own knowledge in justifying our choice of cognitive authorities. Also, once cognitive authorities are chosen, it may look from what has been said so far within this thesis that they all have equal influence on us; but this is actually not the case. The sections bellows review the general understanding on:

- The measures and limits of cognitive authority; and
- The basis of cognitive authority.

3.1. Measures and limits of cognitive authority

Cognitive authority of an individual can be measured according to various parameters:

- Scope of authority;
- Degree, extent, intensity, and weight of authority; and
- Sphere of authority.

3.1.a. Scope of authority

Both De George (1985, p.20) and Wilson (1983, pp.19-20) insist that a cognitive authority is rarely expected to know everything. An individual has greater knowledge compared to his audience in only specific fields or topics which is then considered the scope –or what De George calls realm– of his authority. For example, a particular professor may be considered the authority on human

nutrition, but not on surgery or podiatry. De George (1985, p.31), however, indicates that the limits of this “greater” knowledge should not be construed narrowly. To paraphrase De George, it can be said that, although this professor generally has greater knowledge on human nutrition than his students, he may consider one of his graduate students more authoritative on particular points within the subject of the latter’s dissertation. In other words, the scope of this professor’s authority is generally, but not always, greater than that of his students.

Wilson (1983, p.20) also indicates that what cognitive authorities actually know and what they are believed to know do not necessarily overlap. In particular, the scope of authority can be the results of a negotiation between the bearer and the subject of authority. On the one hand, individuals can plainly state their fields of expertise but their audience may ask them to make some statements outside of these fields. For instance, the fact that the public continuously seeks the opinion of religious leaders on state politics is a direct illustration of this phenomenon. On the other hand, individuals may claim to be experts on a wide range of topics whereas their audience only requests their opinion on only one or two topics. This second case corresponds to what Bocheński qualifies as a “misuse of authority” (1965a, p.59) or even “abuse of authority” (1989, p.62). In all cases, “it is finally for the audience to decide on the scope of the sphere within which it would value the authority’s words” (Wilson 1983, p.20).

De George (1985, p.31) identifies God as the only omniscient being, i.e. the universal epistemic [cognitive] authority for all. Bocheński (1989, p.62) adds that “no human being is an [authority] for anybody in all fields”. But there are exceptional cases where individuals may be considered as universal authority by their audience. Wilson (1983, p.20) gives the example of parents whom young children consider as all-knowing. But Wilson also argues that even adults may consider other adults or institutions to be universal authorities, particularly when they take the concept of cognitive authorities more broad terms: when individuals are not expected to actually have the information and knowledge needed but simply “to be able to find out what others know” (Wilson 1983, p.20). Librarians are typical example of such universal authorities.

3.1.b. Degree, extent, intensity, weight of authority

Within the same field or topic, different sources of information and knowledge are generally granted different degrees of authority. Bocheński expresses the degree of authority in terms of an increase in the probability of a proposition within the state of knowledge of the subject of authority as a result of the communication by the bearer of authority (Bocheński 1965a, p.75, 1989, p.62). Similarly, De George (1970, p.200) talks about epistemic [cognitive] authority in terms of an increase in the probability of a proposition “to be true or more probable than it did before [the bearer of authority] enunciated it”.

De George (1985, p.20) also adds two extra parameters to measure the degree of authority: namely, the extent of authority and the intensity of authority. The extent of an individual’s authority in a given field –for example the authority of our professor on human nutrition– is a function of the number of people for whom he is an authority. By contrast, the intensity of an individual’s authority is as the degree of acceptance of that authority by the people for whom he is an authority –for example, how strongly people believe in our professor’s statements.

Comparatively, Wilson uses the term “weight” which combines the degree of authority and the intensity of authority. Wilson explains that an individual has a lot of authority if the statement he makes “carries a lot of weight for his audience” (Wilson 1983, p.13) or is considered with “different degrees of seriousness” (1983, pp.17). For Wilson, the weight of authority is a reflection of the audience’s perception of the statement as “the truth”. He writes:

the weight that one of my authorities’ words carries weight for me might be so great as to settle questions for me (Wilson 1983, p.18).

Here, when Wilson says that absolute authorities are individuals whose statements are always considered to settle questions, the reference is clearly to the intensity of authority as defined by De George.

3.1.c. Sphere of authority

Wilson (1983, p.19) also introduces this notion of “circumscribed spheres of authority” which combines the scope of authority and the weight of authority.

Wilson explains that each individual has a well defined area of expertise within which the influence exerted on his audience is at maximum: the core of the sphere of authority. As the individual ventures away from the core of his sphere of authority, his influence decreases.

This said, measuring cognitive authority is not an exact science because of challenges in actually conducting objective measurements. More often than not, the decision of weighting the influence received from our cognitive authority is conducted intuitively, almost unconsciously, as Wilson explains:

Since we are only imperfectly aware of the ways and degrees to which what others say influences our thoughts, we are likely to be unaware of the degrees of others' cognitive influence over us and hence of their authority" (Wilson 1983, p.15).

3.2. Basis of cognitive authority

Bocheński, De George and Wilson all discussed how the authority of individuals are identified and justified. The various views are described in the sections below (see also Figure 1). Note that not all strategies identified are applicable to institutional bodies.

From the work of Bocheński

Bocheński offers different accounts of the strategies used by the public in justifying their choice of and reliance to epistemic [cognitive] authorities. Bocheński's most comprehensive account is probably found on pages 62 and 63 of the 1989 paper. There, Bocheński claims that the bearer of authority "does not need to be actually more competent than the subject nor to be really trustful: the belief of the subject that it is so is sufficient!" (p.62). In other words, it is not that an individual deserves authority; instead, it is the trust that other people put in this particular individual which is the basis of his or her status as cognitive authority. The subject of authority must trust two assumptions: (1) the bearer of authority knows more and is more competent than the subject of authority, and (2) the bearer of authority tells the truth and does not lie to the subject of authority. To test these assumptions, particularly the first one, people generally use either their inductive reasoning or their

direct intuition when they try to justify the reliance on their chosen cognitive authorities.

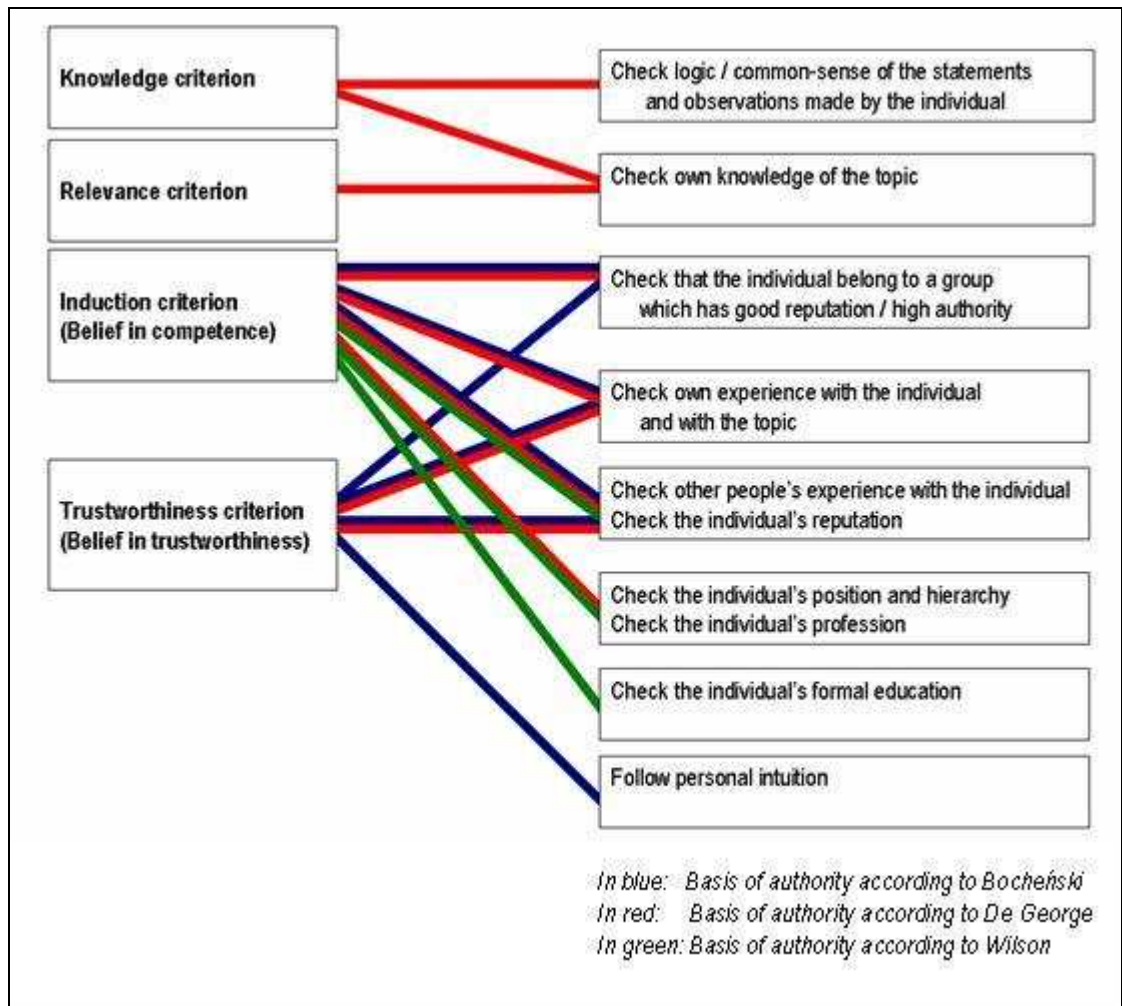


Figure 1. Justifying the choice of a particular individual as cognitive authority

On p.63 of the same paper, Bocheński explains what is meant by inductive reasoning and direct intuition. He first refers to the example of an individual who consults a doctor and asks the question: why would we accept what this doctor says? When we refer to our past experience with this specific doctor who was generally right in his diagnoses, and when we may feel safe to believe that, once again, the doctor must be right; then we are applying our direct inductive reasoning. But we can also apply our indirect inductive reasoning, when we refer instead to the experience that other patients had with the same doctor. Another form of indirect inductive reasoning is based on generalisations made from what is widely known about a particular group of people. Say, if we feel sick in a plane and the plane crew calls for any doctor available on board to step in, the

doctor who intervenes is automatically granted cognitive authority even if no one in the plane has ever known him. In this case, the authority is based on the belief that all doctors are cognitive authorities in matters of health. Here, the transfer of knowledge does not occur between the subjects of authority but between the bearers of authority; more specifically, the authority moves from a group of individuals to a specific individual. Finally, to explain the use of intuition as a justification of authority, Bocheński gives the example of one individual trusting what another individual says just by looking in his eyes, which is like following our “gut feelings” without reference to any other rational ground. And although the reliance on authority based on intuition is observed in real life, it is probably used more often to assess whether a person is telling the truth than whether he is competent.

Some of the strategies listed in the paragraph above are discussed in Bocheński’s earlier publications. For instance, in the chapter taken from the Adelman book published in 1965, the use of intuition is called “justification by trust” (p.74); the reference to our own past experience is called “inductive personal justification” (p.75); and the generalisations made from what is widely known about a particular group of individuals is called “inductive social justification” (p.75). Additionally, on p.59 and p.60 of the same book chapter, Bocheński introduces the reference to the institutional affiliation of an individual as another form of indirect inductive reasoning to justify authority. Here, Bocheński reports that we trust some individuals because they claim they belong to a recognised authoritative institution. I can easily imagine people doing such things explicitly by saying “I am from the Royal London Hospital” and by providing some form of personal identification, documents and other artefacts as proofs. But Bocheński indicates that individuals could also do things in more subtle ways and cites the example of a person who makes an official statement and who signs the declaration with his or her full scientific titles. According to Bocheński, this person is implicitly claiming thereby that he or she is speaking “in the name of science”. To push the argument even further, I would add that, if the titles used by the person cited in the example offer obvious indications that the person is speaking within his or her area of expertise (e.g. a GP should know about health matters), then our reliance on the authority may be considered legitimate. But if the titles are unfamiliar (e.g. not everybody know

that BHS stands for Bachelor in Health Science), vague (e.g. the title “PhD” does not specify in which discipline is the person an expert on), or irrelevant (e.g. a MBA degree does not warrant authority in medicine), then our reliance on their authority may be unreasonable or even wrong.

It should be noted that not all of these strategies actually used in society to justify authority are legitimate. In fact, Bocheński (1989, p.63) warns that the reliance to authority by inductive reasoning is “logically weak” –hence it should be viewed with suspicion– and the reliance on authority “morally wrong”.

From the work of De George

De George (1985, pp.34-42) seems to be the most exhaustive in the description of “legitimate” justification of our reliance to epistemic [cognitive] authority. For him, four criteria need to be verified simultaneously: (1) the knowledge criterion; (2) the inductive criterion; (3) the relevance criterion; and (4) the trustworthiness criterion. In contrast to what Bocheński claims above– De George insists on the importance of the knowledge criterion which states that the bearer of authority actually has knowledge of the topic which forms the scope of his authority. For this, it can be checked whether what the bearer of authority communicates makes sense or not. Also, anyone can try to gain the same knowledge through alternative ways and compare this acquired knowledge with what the bearer of authority previously communicated.⁴ Of course, this option is generally avoided in real life since it is precisely to avoid spending more time in trying to acquire knowledge on our own that we are referring to our cognitive authorities.

De George’s second criterion –labelled “inductive criterion”– is closely related to the first criterion and states that the subject of authority has good reasons to believe that the bearer of authority has such knowledge. Clearly, De George’s second criterion is similar to Bocheński’s competence criterion. Here, it is possible that the subject of authority submits to a first-order authority or a

⁴ In this particular case, the superiority of the bearer of authority is based on the fact this latter dedicated more time gaining knowledge and experience on a specific topic than other people who remain subjects to this authority until they also improve their own knowledge and experience.

second-order authority. If the subject of authority already has some basic knowledge of the topic under discussion and if he acknowledges that his knowledge is inferior to that of the bearer of authority (see also knowledge criterion), his reliance to this superior knowledge is a form of first-order authority. If, on the contrary, the superiority of the knowledge of the bearer of authority is certified through other ways –for instance as certified by other people– the reliance to this superior knowledge is a form of second-order authority. It should be noted that this certification of superior knowledge by other people is equivalent to what is described by Bocheński as generalisation from a group to particular individual. In such instances, De George uses the term “collective induction” because it is a collective decision by society to certify that a specific group of people have certain knowledge. To take a specific example, the fact that society certifies that doctors in general have superior knowledge to cure illnesses it is a good enough reason to believe that a specific doctor also has this type of knowledge. Additionally, De George indicates that the fact that an individual is holding a certain position in society can be another reason to believe that this individual has the knowledge generally expected for this position, as explained below:

We do not usually think that we make someone a *de facto* authority by believing what he says. Rather we encounter someone who holds a certain position or title of who speaks knowledgeably about a topic, and because of his position or title or apparent knowledge, we believe him (De George 1985, p.30).

There are times when epistemic [cognitive] authorities are actually recommended or designated by other people. Taking the example of a school principal who introduces a new teacher to a class, De George (1985, p.29) indicates that the principal’s words generally mean that the teacher is “knowledgeable in his field and worthy of being believed by the students”, in other words, the principal introduces the teacher as a valid authority. But it is still up to the students to later choose whether they really consider the teacher as their epistemic [cognitive] authority or not.

De George’s third criterion –labelled “relevance criterion” – stipulates that a specific statement made by the bearer of authority falls within –or is related to– the scope of authority of this latter. As in previous criteria, the subject of authority needs to apply his prior knowledge in ensuring that this criterion is

fulfilled. After all, believing in claims made outside the recognised scope of authority is a submission to an abusive form of authority.

Finally, De George's fourth criterion or trustworthiness criterion states that the subject of authority has good reasons to believe that the bearer of authority is telling the truth. The subject of authority can apply some direct inductive reasoning –similar to what is suggested by Bocheński– and refer to his past experience with the bearer of authority: the fact that the bearer of authority has told the truth in the past, then, there are good reasons to believe that he will continue to do the same. Similarly, the subject of authority can also apply some indirect inductive reasoning, refer to the experience of other people and see whether they trust the words of the bearer of authority or not. In De George's writings, there is no mention of intuitions or gut feelings being good enough reasons to believe that the bearer of authority is telling the truth.

From the work of Wilson

Wilson (1983, p.15) aligns with both Bocheński and De George in saying that it is the trust, belief of the subject of authority in the credibility of the bearer of authority which is at the crux of cognitive authority. But more than Bocheński, Wilson insists on the need for the bearer of authority to actually have superior knowledge. In fact, Wilson seems to refer to something similar to De George's first and fourth criteria when he writes:

Cognitive authority is clearly related to credibility... The notion of credibility has two main components: competence and trustworthiness... A person is trustworthy if he is honest, careful in what he says, and disinclined to deceive ... A person is competent in some areas of observation if he is able to observe accurately or investigate successfully (Wilson 1983, p.15).

For Wilson (1983, pp.21-22), it is not possible for the subject of authority to directly test the knowledge of the bearer of authority; hence, Wilson instead suggests four indirect tests or indices of credibility. Wilson's first index of credibility is the occupational specialisation of the bearer of authority. In other words, an individual is qualified to speak on a specific subject if he makes his living working on or dealing with that subject. To some extent, this index of credibility is equivalent to the transferred authority from a group of

authoritative individuals as described by Bocheński or the assumed authority due to position held in society as described by De George.

Wilson's second index of credibility is based on formal education. Here, the bearer of authority is considered knowledgeable on a subject if he has "studied the subject systematically and deeply and has earned an advanced degree in the subject" (Wilson 1983, p.21). A corollary of this rule is that a diploma serves as a proof for cognitive authority. Wilson adds that it is often the combination of the formal education and the professional experience which allows one individual to be a legitimate cognitive authority for others.

But there is an even higher level of cognitive authority: the authority of the experts. Here, the knowledge has to be recognised as superior and outstanding stature by other experts. This last point touches on the third index of credibility; namely the reputation. Here, the fact that a number of scientists highly regard one specific individual encourages others to also do the same. Wilson warns, however, that the reputation rule for identifying great experts is not always easy to use. There are a couple of reasons for that. On the one hand,

a reputation may be high in one group of supposed peers and low in another, and it is not always reputation among peers that is taken into account. One might have reputation outside the peer group and lesser one inside. The outsiders' opinions may outweigh the insiders (Wilson 1983, p.22).

On the other hand,

the reputation rule will give different results depending on how one chooses the appropriate group, the reference group, whose collective opinion is taken as an index of competence (Wilson 1983, p.22).

Wilson adds that using the reputation rule to identify authority increases the risk of missing people who could be legitimate cognitive authorities, as indicated below:

we have no way of identifying those neglected geniuses who are unduly or improperly ignored or denigrated by their peers, but there is nothing we can do about that if we lack independent tests of competence (Wilson 1983, p.22).

I would argue that the local culture and context influences people's perception of the various indices discussed above. For example, the mere fact that individuals have attended school grants them authoritative status in some

countries whereas, in other countries, a college degree, a Masters or a PhD are barely enough to claim for knowledge, to earn a professional position in the field and to gain peers' recognition.

More generally, within societies where so many people can claim to be experts in a given field, it is real challenge to identify those with outstanding expertise to use as cognitive authority. De George (1985, pp.26-27) touches on this last point when he discusses that it is not always clear how much knowledge is enough to grant authority and when he states that the degree of recognition is associated with the extent and limits of the authority.

4. Cognitive authority in the case of texts

Although it is established that cognitive authorities are mostly individuals, there are opposing views on whether cognitive authorities can also be found in texts. Bocheński (1989, p.62) does not recognise authority in texts. For him, both the subject and the bearer of authority –whether it is cognitive or deontic authority– should be conscious beings; which is not the case with texts. Of course, all documents are written by conscious individuals and it could be argued that the authority of these individuals is transferred to the texts they produced. Yet Bocheński does not allow such a transfer of authority: the authority remains with the individuals. To illustrate his point, Bocheński cites the example of Law and argues that the authority is not in any piece of paper but rather in the president of the parliament who ratifies the law according to certain voting rules. Although Bocheński refers here to deontic authority, there is no reason to believe that his views are different when it comes to epistemic [cognitive] authority.

By contrast, De George recognises epistemic [cognitive] authority in texts. In particular, he writes that the bearer of authority needs not be a conscious individual but could be a text or other human artefacts (De George 1970, p.200, 1985, p.16).⁵ Taking the example of reference materials such as dictionaries and encyclopaedias as well as textbooks and newspapers, De George (1985, p.28) later explains that, in theory, it is the individual who writes the text who is the

⁵ De George adds that epistemic [cognitive] authorities can also be an abstract concept, or the knowledge of a discipline, a practitioner within that discipline; or even one's own conscience.

authority on the topic discussed in the text, but, in practice, the author is often ignored by the public who simply put their trust in the text. And in these examples, the texts –not the authors– are the *de facto* authority.

Wilson agrees with De George's claim and writes that there are cases where "a text may acquire cognitive authority independent of the authority of its author" (Wilson 1983, p.168). For instance, it is indicated that:

For the very naïve people, any publication may carry authority; the mere fact of something being said in print or over a broadcast medium is enough to give it weight (Wilson 1983, p.81).

Even among the more educated public, texts which have been used by many or which have been used for quite some time can gain a reputation –hence an authority– of their own. Some types of text in particular fall under that category. Like De George, Wilson cites reference materials as the typical authoritative materials independently of the authority of the authors. For instance, the public generally consider dictionaries as the absolute authority in questions of orthography, pronunciation, and meanings of words with little need of knowing who made the compilation (Wilson 1983, p.81). But Wilson also recognises the authority of textbooks –which are "accounts of what is accepted by the whole scientific community and what has been collectively agreed on" (Wilson 1983, p.85)– as well as the authority of religious texts –which are viewed as "infallible revelations from the supernatural and infallible sources of historical knowledge and moral guidance" (Wilson 1983, p.81). Occasionally, a published work which has simply gone through many revisions and re-editions can gain and increase authority to the extent that it may be "thought of as an institution in its own right" (Wilson 1983, p.169).

In contemporary dictionaries, there are clear mentions of texts taken as authorities within entries on "authority". For instance, one can read in the *Collins Dictionary of the English Language* (1979) that an authority can be "an authoritative written work in a particular field". In this case, it seems that it is the written text itself and not the author of the text which is the bearer of authority; i.e. it is the text which influences our knowledge in a particular field. But the definition of authority also incorporates the use of published texts as helpful resources which give advice and opinions on uncertain topics and which

settle questions in areas of controversies.⁶ For instance, *The Oxford English Dictionary* (1989) talks about “the quotation or book acknowledged, or alleged, to settle a question of opinion or give conclusive testimony” and the *Webster’s Third New International Dictionary of the English Language* (1986) talks about “a citation (as from a book) used in defence or in support of one’s actions, opinions, or beliefs” as well as “the source from which such a citation is drawn”.

It is a fact of life that, in our search for knowledge, we indeed turn to texts – published texts– without paying much attention to the authors. Here, and in the rest of the chapter, I intentionally put the emphasis on “published texts” because of their capacity to reach the public and to appear more authoritative than unpublished texts. To allow us make informed choice among the mass of published texts, we need to not only know how to assess their authority but also to understand when it is legitimate to rely on our chosen texts.

4.1. Measure of cognitive authority

Understandably Bocheński –but surprisingly De George and Wilson also– show little interest in the evaluation of the authority of published text. Their writings only sporadically include a sentence or two pertaining to the scope of authority or extent of authority. For the other parameters used to measure cognitive authority, I draw a parallel with what is discussed earlier regarding the measure of individual authority and I suggest practical ways of comparing published texts.

4.1.a. Scope of authority

As in the case of individuals, texts generally cover a limited range of topics. In the case of published texts, the range of topics covered can be identified relatively easily through a cursory look at the title, the table of contents or the index. The depth of subject treatment can also be estimated through the same technique and be incorporated in the measure of the scope of the texts. In fact, combining the two approaches may be recommended when comparing the authority of two texts dealing with similar or relatively close topics.

⁶ These are clearly one of the major roles of cognitive authorities as explained in Section 2 on p.19.

I believe there are lesser risks of abuse of authority in the case of published texts. Indeed, the content and scope of published texts are set. Readers should have no reason to seek for information beyond the claimed scope of the work. Exceptions could happen in case of misinterpretation from the part of the readers or in case of mistake or deception from the part of the authors or the people in charge of marketing the product.

As in the case of individuals, it is also possible for texts to be considered universal authorities. Wilson (1983) himself acknowledges several times that some religious texts and reference materials such as dictionaries and generic encyclopaedias are assumed to encompass all topics.

4.1.b. Degree, extent, intensity, and weight of authority

I believe the definitions of degree of authority, extent of authority, intensity of authority and weight of authority as discussed in the case of individuals⁷ can be directly applied to published texts. Indeed, these three parameters rely less on the characteristics of the bearer of authority –the published text– and more on the reaction from the subject of authority –the reader.

Regarding the extent of authority in particular, the definition can be modified to accommodate more pragmatic approaches. Originally, the extent of the authority of a published text is measured in terms of the number of people who considered this text as authoritative. A literal application of this definition is impractical because of the difficulty of surveying all people within a city, a region or a country regarding their opinion on a specific published text. But measuring the extent of authority may be made easier if proxies are considered instead. For instance, it may be easier to conduct a survey at the level of institutions such as libraries or schools. Knowing that librarians are experienced in selecting authoritative texts for their clients, the librarians' personal choice – or the libraries' bibliographic catalogues– could be used as proxy in the task of assessing the authority of specific texts. This approach would not provide a definite measure of authority but, at least, it would offer some relative values through the comparison of the authority of various texts with one another.

⁷ See Section 3.1.b on p.23

Indeed, the higher the number of librarians who would choose the text –or number of libraries which hold the text– the greater the extent of the text authority.

One approach which is commonly observed in information science is the analysis of citation patterns (Summers 1984, Moed and Garfield 2004). Here, the texts which are most cited by scientists in their publications are considered the most authoritative in the field. Some online database and online search engines are already automatically listing the publications which are referring to a specific article or book.⁸ There are also information service providers which are offering citation indices.⁹ There are limitations in the use of citation analysis as a measure of authority, including the instability of the publication ranking which varies according to the way in which citation indices are calculated (Meho and Yang 2007, Bhushan and Kumar 2010). More problematic is the fact that citation patterns may fail to capture authority because of unpredictable social factors; for instance, interpersonal and professional ties which can affect the way in which scientists cite publications by their peers (White *et al.* 2004).

4.1.c. Sphere of authority

Once again, the definition used for individuals can be directly applied to published text because the notion of “circumscribed spheres of authority” depends on the perception of the public at the receiving end of the text.

Wilson (1983, p.81) highlights the fact that all statements within religious texts may be considered unquestionable by some believers. But I would argue that this is not the only instance where the weight and sphere of authority of a text can reach unusual proportions. I am thinking particularly on the case of cultures where information literacy is extraordinarily low. There, any statement from any published text may be granted equal and absolute authority based on the mere fact that it is published.

⁸ See for instance Google’s applications GoogleScholar and GoogleBooks, accessible from www.scholar.google.com and www.books.google.com respectively

⁹ See for instance Thomson Reuters’ *Web of Knowledge* and *Web of Science*, both accessible from www.thomsonreuters.com

4.2. Basis of cognitive authority

Although De George recognises the authority of texts, his interests mostly focus on the authority of individuals. By comparison, Wilson looks more beyond what is happening at the level of the authors and offers valuable pointers on how to check whether a published text can –rightfully or not– be considered as an authority (De George’s and Wilson’s views are summarised in Figure 2).

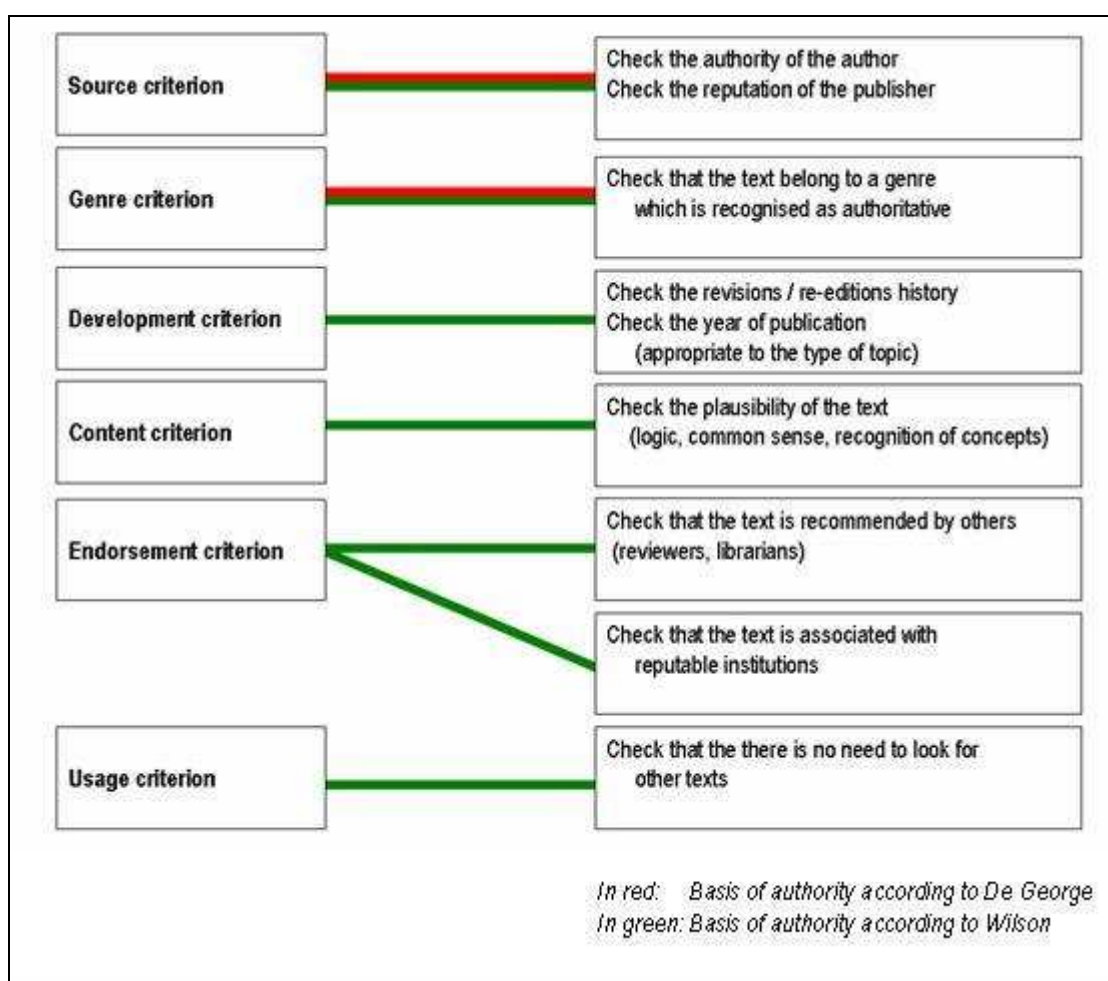


Figure 2. Justifying the choice of a particular text as cognitive authority

From the work of De George

For De George, checking the legitimacy of the authority of texts seems to be equivalent to checking the legitimacy of the authority of the authors. So, De George’s suggested tests regarding the basis of the authority of individuals as seen on p.27 are suitable here. In fact, there is no reason to limit the study of authority to the tests and indices suggested by De George as even those

suggested by Bocheński and Wilson on p.24 and p.29 respectively are equally valid.

De George (1985, p.28) also highlights the fact that the public sometimes choose to trust a text simply based on the fact that this latter falls within a specific genre. He cites the case of dictionaries, encyclopaedias, textbooks and newspapers as examples. I would, however, add that considerations for the topic or for the context may be required in some circumstances. For instance, it may be acceptable to consider newspapers as legitimate authorities on current affairs but not on scientific advances. For information on this latter topic, it may be more appropriate to check encyclopaedias but probably only for every-day information search and not necessarily for the writing of academic assignments.

From the work of Wilson

Wilson reports various ways whereby the public justify their choice of a specific text as cognitive authority. Besides the reliance on the authority of the author, there is the authority of the publisher. In his analysis of the knowledge industry, Wilson draws our attention to the fact that there are publishers which are known to be the “big producers of works of high quality” and which are “the winners of the struggle for recognition of cognitive authority” (1983, pp.45-46). He further explains that,

A publishing house can acquire a kind of cognitive authority not that the house itself knows anything, but that it is thought to be good at finding those who do and publishing their work (Wilson 1983, p.168).

In other words, because of the fact that a publisher has a history of working with authoritative authors, it is assumed that any other texts from the same publisher have authoritative authors. This is some form of indirect inductive reasoning.¹⁰

The reference to the publishing history is also sometimes used by the public to assess the authority of a text. More specifically, Wilson (1983, p.168) claims that the “issuance of several successive editions and translations serves as an indirect test of authority [counts] as an extraordinary accomplishment”. The underlying argument here is that a text which benefits from a sustained attention from its

¹⁰ See p.25 for further explanation on direct and indirect inductive reasoning

author, publisher and/or translators must have some particular value. Although Wilson does not mention the word “quality”, it is easy to conclude that a text which is reprinted is highly demanded by the public, possibly due to the quality of its content. In the case of new editions –as opposed to reprints– there is also the added expectations that the content has been improved, or at least updated.

Another strategy commonly used by the public is the reliance on the recommendations from other people. I say that we may choose a book because it was recommended to us by people whom we already consider as our cognitive authorities (parents, teachers, etc.) or because many people around us –not necessarily our cognitive authorities– talked about it. Wilson (1983, p.68) recommends that only the recommendations of experts should matter and discusses, for instance, the recommendations in published reviews. He warns the public that

if the reviewer already has cognitive authority for us, his review constitutes a personal recommendation (or not). If we are given sufficient information about the reviewer, along with the review, we may be able to arrive at an estimate of his authority. If the reviewer is unknown, his judgment may mean nothing, while if he is an anti-authority, unreliable and wrong, his praise may be fatal to the works he reviews" (Wilson 1983, p.168).

But it is the recommendation from librarians which is considered most valuable. An entire chapter is dedicated to it within Wilson’s book (1983, pp.165-196). Wilson argues that a librarian knows how to recognise cognitive authorities, not only from practice, but also from principles already widespread within his profession. For instance,

[t]he individual librarian does not have to evaluate the books from which he takes answers to questions. Others have done that already; the profession as a group has collectively decided that they can be relied on (Wilson 1983, p.184).

There is an additional form of recommendation; one that is made –not by an individual but by an institution– and called “institutional endorsement” (Wilson 1983, p.168). Examples of institutional endorsement are: sponsorship of a publication by a learned society or professional organisation, the publication by a governmental agency or state printer, use as a textbook by teachers in prominent educational institutions, and the award of prize to the text (or to the author of the text).

It is, of course, possible for the public to evaluate the authority of a text without any reference to the people who are involved in the writing, publishing or dissemination of the text. Like De George, Wilson (1983, p.184) recognises the authority of texts which fall under the genre “reference works” –another principle within librarianship. But there is also the test of time, i.e. when the text was published. This test only provides a relative measure of authority, i.e. it only allows the public to compare between different publications. This test also highly depends on the topic. Indeed, on some topics, the rule is “the older the better”; whereas, on other topics, it is the total opposite. For instance, a text on a topic within (what Wilson calls) “progressive science” may be most authoritative if it is recent. Wilson also identifies the “test of intrinsic plausibility”. This is a very pragmatic test which consists of a rapid assessment of a brief excerpt of the work. The rule for choosing authority is based on the perceived plausibility of the content combined with some instant recognition of key characteristics of the work: the school of thought, the theoretical framework, the research paradigm, etc. In practice, the rule is simply:

If the sample of text we read strikes us as nonsense, we are unlikely to continue; if it seems eminently sensible, we may read on (Wilson 1983, p.169).

For Wilson, the ultimate test of authority is to ask the question “Need I look further, or can I take this source as at least provisionally settling the matter?” (Wilson 1983, p.169). Here, the recommendation is to make sure that “one needed not only to find reasons for taking the single source seriously but also for thinking that there were no other sources deserving to be taken still more seriously”. But Wilson himself, however, recognises that this last condition is difficult to achieve. In a world inundated by information and publications, besides “universal authorities” such as dictionaries and reference works, there are no other obvious choices of alternative authorities. Generally, we do not waste our time looking for the most authoritative texts; instead, we evaluate whether whatever texts we manage to find seem authoritative enough for our taste. So, our cognitive authorities may change anytime we find new authors and new publications more authoritative.

5. Towards an understanding of encyclopaedia authority in general

The concept of cognitive authority has many facets but this chapter has illustrated that the focus of existing literature is generally on the people who are subjects to the authority: how they measure authority, how they choose their cognitive authority, or how they justify the reliance to this authority.

Much less is said from the perspective of the bearer of authority. In fact, the chapter mostly highlights two areas of discussion. The nature of knowledge of the bearer of authority is one of them; more specifically, what kind of knowledge and how much knowledge could potentially grant a status as cognitive authority. The second area discussed is the use of this knowledge; i.e. what does the bearer of authority do with this knowledge to the subject of knowledge.

From the findings of this chapter, it is obvious that studying the authority of an individual is different from studying the authority of a text. Although part of the authority of a text comes from the authority of its author, the procedures to measure and to justify authority are different in these two cases. In fact, the chapter offers some theoretical foundations for any study of authority in general, and for the current study of encyclopaedia authority in particular.

A few times, the discussion from existing literature on cognitive authority could be expanded. For instance, I have not noticed any discussion regarding the interplay between cognitive authority and deontic authority. I would assume that the charisma of a person (posture, appearance, attitude, etc.) or the aesthetic aspects of a publication (illuminations, illustrations, bindings, etc.) have some influence on the public's perception of who or what is authoritative. It is true that reliance on such superficial characteristics would not allow the public to find legitimate authority, but I believe the strategy is used in real life nonetheless. Another point which seems to have been overlooked in existing literature on cognitive authority is the impact of societal culture on any authoritative relationship. But the point which appears to be begging for more attention, particularly in the discussion on published texts, is the importance of quality assessment as part of the identification of authoritative material. On many occasions, there seem to be implicit references to the quality of the

information communicated, but the discussion is never carried further. Luckily, there is an abundant literature on information quality assessment, which will be reviewed in the next chapter in an attempt to tease out the relationship between assessing authority and assessing quality.

CHAPTER 2.

THEORY OF QUALITY

As mentioned several times throughout the previous chapter, the theory of cognitive or epistemic authority seems to overlook the quality of the information actually communicated. This is surprising since, even in everyday language, the concept of quality and authority are often used interchangeably. For example, members of the public often understand the same thing from the expressions “a text of quality” and “authoritative text”. The current chapter mostly focuses on reviewing the various dimensions of information quality. It identifies the various parameters listed within existing frameworks for quality assessment before summarising library and information specialists’ expectations on reference materials. Ultimately, the chapter starts to tease out the commonalities and differences between the concepts of quality and authority. And, to go back to the focus of the thesis, the chapter ends with some recommendations for the conduct of the study of encyclopaedia authority.

1. Introduction to quality and quality assessment

In modern dictionaries, when the term quality does not mean the general attributes, characteristics or distinguishing features of a person or a thing, it is typically associated with the concept of standard, superiority and excellence. For instance, *The Oxford English Dictionary* (1989) talks about quality in terms of “degree or grade of excellence, etc. possessed by a thing” whereas the *Collins Dictionary of the English Language* (1986a) talks about “degree or standard of excellence, esp. a high standard”. The *Collins Today's English Dictionary* (1995) adds that “high standards in general are sometimes called quality.” Similarly, the *Webster's Third New International Dictionary of the*

English Language (1986b) lists under the second bullet point within the entry on quality:

- 2a(1) degree of excellence
- (2) degree of conformance to a standard
(as of a product or workmanship)
- b(1) inherent or intrinsic excellence of character or type:
superiority in kind.

Defining quality in practice is a difficult task because –as explained by Harvey and Green (1993, p.10)– quality is often referred to as “a relative” or “a slippery concept”. More specifically, Harvey and Green identify two ways whereby quality is relative. On the one hand, quality depends on the users’ use of the term and on the circumstances under which the term is used. In other words, quality varies according to the different users’ perspective. On the other hand, quality depends on some relative benchmarks, although some benchmarks are more “absolutist” than others. For instance, there is the notion of “uncompromising, self-evident, absolute quality.”¹¹ But quality can also be considered reached when a product meets or exceeds the standards imposed by some regulatory agencies or when a product meets the self-imposed threshold adopted by the manufacturer.¹²

Assessing the quality of abstract products such as information is an even more challenging task which typically requires the consideration for many parameters (Miller 1996, Fritch and Cromwell 2001, Stvilia *et al.* 2007a). When asked to assess the quality of information, even topic experts can have difficulties reaching a verdict (Amento *et al.* 2000).

2. Librarian’s approach to quality assessment

Considering the importance of reference materials in libraries, it is not surprising that frameworks to assess the quality of these materials are primarily developed for librarians in order to help them build the most appropriate reference collection for their needs. Additionally, various guides for encyclopaedia buyers, as well as the literature on information science and

¹¹ The notion of absolute quality is similar in nature to the notion of truth or beauty (according to Sallis and Hingley quoted in Harvey and Green 1993, p.10).

¹² Harvey and Green (1993, p.11) add that quality can also be viewed as “*exceptional, perfection* (or consistency), *fitness for purpose, value for money*, and as *transformative*.”

reference services sometimes provide theories on quality assessment. But whatever their sources, these frameworks are ultimately intended to help both the librarians and the members of the public to identify which parameters to look for when they are conducting the quality assessment themselves or when they are relying on other people’s recommendations such as in a book review for instance.

Among the earliest and most widely adopted frameworks for quality assessment are the ones developed by the American Library Association (ALA). Examples of key ALA publications are the *Basic Reference Books: An Introduction to the Evaluation, Study, and Use of Reference Materials* (which was published under the lead of Shores in 1937) or the booklet *Purchasing an Encyclopedia: 12 Points to Consider* (first published in 1979 but also reprinted and reedited several times). Many library specialists have expanded or developed variants of the ALA’s framework to assess the quality of reference materials and encyclopaedias –including frameworks specific for *Wikipedia*– as well as to assess the quality of and information in databases. The literature considered for the current chapter is listed in Table 1.

Table 1. List of publications with a comprehensive framework for quality assessment

Reference materials in general	Encyclopaedias in general	<i>Wikipedia</i> in particular	The case of databases
<ul style="list-style-type: none"> - Shores (1939) - Stevens (1986) - Lang (1987) - Large (1989) - Katz (1992a, 1992b) - Starr (1994) - Smith (2001) - Singh (2003) - Crothers (2008) 	<ul style="list-style-type: none"> - American Library Association (e.g. 1996) - Kister (1981, 1986) - Sheehy (1986) - Katz (Katz 1992b) - Crawford (Crawford 2001) 	<ul style="list-style-type: none"> - Glasser and Stvilia (2001) - Stvilia and collaborators (2005a, 2005b, 2007b, 2008, 2009) - Lichtenstein and Parker (2009) - Arazy and Kopak (2011) 	<ul style="list-style-type: none"> - Large (1989) - Katz (1992a, 1992b) - Martin (1992) - Stvilia (2006) - Stvilia and collaborators (2004, 2007a, 2008)

As in the example of the American Library Association’s *Purchasing an Encyclopaedia: 12 Points to Consider*, the frameworks from Table 1 consist of

lists of parameters. It is, however, rare that these lists explicitly define the characteristics of a good or a bad encyclopaedia. Instead, a general description of the encyclopaedias is provided without any value judgment. It is left in the hands of the encyclopaedia buyers and users to assess the quality of encyclopaedias based on their individual circumstances such as personal interests, level of readership, context of use, or available budget.

3. Librarians' expectations on the various parameters for quality assessment

There is a great diversity among the frameworks and empirical studies mentioned above. Not only is there a variation in the number and choice of parameters, but the same parameters are also often labelled and categorised differently from one framework to another. In fact, some frameworks are longer and more elaborated than others; the extreme example is the list elaborated by Sheehy (1986) which has as many as 55 parameters grouped into five categories.

In an attempt to develop a comprehensive yet utilisable framework, the parameters from the literature described above are compiled in a single list of 24 parameters grouped in five main categories:

- Category 1. Importance within the industry;
- Category 2. Encyclopaedia production;
- Category 3. Encyclopaedia content;
- Category 4. Information retrieval; and
- Category 5. Delivery.

The parameters within each category are primarily described according to the recommendations from the publication listed in Table 1, starting with those on encyclopaedias in general and on *Wikipedia*, before considering the case of other reference materials.

Category 1. Importance within the publishing industry

There are six parameters that are used to describe a particular reference material and to verify its importance within the publishing industry:

- Purpose of the work;
- Scope of the coverage;
- Targeted audience;

- Worth for the audience;
- Aesthetic aspects; and
- Uniqueness of the work.

In some cases, potential buyers only need to check the statements made by the publisher. In other cases they need to conduct their own quality assessment.

Purpose: First, potential buyers need to know the reason why the work they are contemplating buying was developed, for example, for documentation or for education (Stevens 1986, Smith 2001). But they also need to know what effect the authors wanted to have on their readers (Lang 1987). Starr (1994) indicates that defining the purpose of a reference material is more straightforward in printed materials than in online ones as the welcome screen in online materials may provide vague or confusing information. On the other hand, it is also important to check whether these purposes have been met. As Katz (1992b, p.23) warns, “The publisher usually will state the scope of the book in the publicity blurb or in the preface, but the librarian should be cautious. The author may or may not have achieved the scope claimed”.

Scope: Publishers are also expected to clearly state the general subject covered in the reference materials they publish (Large 1989, Lichtenstein and Parker 2009); however, they could also indicate in which specific areas the emphasis was made (Katz 1992b, Crawford 2001). When appropriate, geographic boundaries and time limitations should also be stated (Smith 2001). Additionally, Singh (2003) suggests that potential buyers should also check the type of materials used within the work.

Audience: Potential buyers also need to make sure that the work is appropriate to their use. Publishers usually indicate the profile of the targeted readers and typically specify their age, educational and reading level (Katz 1992b, 1992a) as well as their areas of interest (Lang 1987) and actual information needs. In fact, the publishers should make clear whether their encyclopaedias are targeted to the basic learner, the users with general queries and those with scholarly and specialised needs (Crawford 2001). But it is also important to check whether the publishers’ claims are justified. For this, various questions can be considered:

- Is the subject coverage adequate (Encyclopaedia Britannica Inc. 2006, Crothers 2008)?

- Is the content of the information suitable (Stevens 1986)?
- Is the presentation of the information appropriate (Lang 1987)?

If no indication of the targeted audience is made, librarians should be able to make an educated guess based on the terminology used and the depth of the subject treatment; though Starr (1994) recognises that doing the same for online materials is often difficult.

Worth: In contrast with the previous parameter, the focus, here, is on the usefulness of the entire work for the targeted audience. For example, Stevens (1986) encourages potential buyers to evaluate whether the information provided in the work would be of any value for them whereas Lang (1987) insists on the need to check whether there is “a message to take home” or not. Kister (1986) suggests very pragmatic questions such as: Do you need it? or Will you really be using it? On the other hand, librarians are particularly recommended to check the extent to which the acquisition of a specific reference material would contribute to their existing library collections (Stevens 1986, Crawford 2001). Finally, as a way to quickly assess the worth of a particular title, Kister (1986) advises all potential buyers to check what was said about the reference material in published reviews.

Aesthetics: This parameter is about the general appearance of the work. Typically, a lot of emphasis is given to the physical make-up: the binding, the paper, the ink, the size and number of volumes and the outside packaging (Shores 1939, Kister 1986, Crawford 2001). Some researchers also discuss the importance of the typography and layout of the text (Sheehy 1986). Another important aspect is related to the illustrations which not only should be attractive and have some artistic value but should also be reproduced with the highest standards, particularly the colours (Katz 1992a, Smith 2001). Additionally, some researchers recommend that close attention is paid to the writing style which has to be clear and appealing to the readers (Lang 1987), engaging (Crawford 2001), and “interesting but not intruding” (Crothers 2008).

Uniqueness: This specifies the characteristics which distinguish a specific reference material. This latter has to either do better than others or to have something that other works do not have, for example, the content is original

(Large 1989, Katz 1992b), the writing style is “authentic” (Lang 1987) or there are unique features which set the reference material apart (Kister 1986).

Category 2. Encyclopaedia production

Here, potential buyers are encouraged to check whether the way how the reference material is developed is conducive to quality. Two parameters are considered:

- Process of production; and
- Credentials of those who contributed to the production.

Production process: This parameter is mostly discussed by the researchers who are studying *Wikipedia*. Here, the focus is on the numerous mechanisms in place for the creation and control of quality content, for example: the number of contributors intervening on the same article (Wilkinson and Huberman 2007) or the division of tasks between various types of *Wikipedia* contributors (Kittur *et al.* 2007, Viégas *et al.* 2007, Wilkinson and Huberman 2007, Butler *et al.* 2008, Kittur and Kraut 2008). Researchers have also identified features leading to the destruction of quality, such as the action of “vandals” or the disputes among *Wikipedia* contributors (Arazy and Kopak 2011).

In the case of traditional reference materials, however, only two aspects of encyclopaedia production are identified as quality assurance mechanisms: the intervention of skilled writers or encyclopaedists –as opposed to simple subject experts (Crawford 2001, Encyclopaedia Britannica Inc. 2006)— and the intervention of peer-reviewers (Singh 2003). The American Library Association (1996) adds that the editorial staff within publishing companies sometimes play a major role in the production of reference materials, including the writing of short entries or the editing of articles submitted by subject experts.

Credentials of the contributors: This aspect is given great importance in both traditional reference materials and in *Wikipedia*. In the first case, buyers and users of reference materials are encouraged to check if the various people involved in the production can be identified and if their credentials can be checked (Singh 2003). For the authors and editors, credentials are not only based on the level of expertise as assessed from their education, occupation and

qualifications or titles (Stevens 1986, Singh 2003) but also based on their authority and reputation as well as on the significance of their work within their communities (Lang 1987, Large 1989). Shores (1939) indicates that the presence of outstanding and particularly authoritative names deserves a notice.

The qualification, authority and reputation of the publisher is also considered important. Some publishers are known for issuing excellent reference materials whereas others are known for their fair-to-untrustworthy titles (Katz 1992a). Additionally, Smith (2001) suggests that considerations should be given to the body sponsoring the work.

When a new edition of a dictionary or an encyclopaedia is released, Sheehy (1986) encourages potential buyers to verify whether the standards in terms of contributors' credentials are maintained or not. The American Library Association (1996) particularly reminds us that some of the original authors may have actually already retired or passed away whereas their articles may still be used in new editions, which may affect the currency of these articles or even of the entire encyclopaedia.

In the case of *Wikipedia*, checking the credentials of contributors has to be conducted in ways different from that recommended above because of the impossibility of establishing with certainty the identity of contributors. Indeed, contributors could remain anonymous or they could create a *Wikipedia* account with a pseudonym or with their real name, along with their personal and professional details. A few approaches can be used to assess the credentials of individual *Wikipedia* contributors; for example, to refer to the number of edits made by each contributor (Kittur *et al.* 2007, Pellegrini and Gao 2009) or to look at any administrative position that he or she holds within the *Wikipedia* community (Burke and Kraut 2008, Butler *et al.* 2008, Panciera *et al.* 2009).

Category 3. Encyclopaedia content

To assess the quality of the content or a reference material, potential buyers can focus their assessment on nine parameters:

- Completeness;
- Clarity;
- Accuracy;

- Reliability;
- Objectivity;
- Currency;
- Stability;
- Informativeness; and
- Representativeness.

Completeness: Here, the assessment has to be conducted at various levels. The subject coverage has to be checked: is it comprehensive (Large 1989, Katz 1992b)? Is it complex enough yet cohesive (Stvilia *et al.* 2005a, Stvilia *et al.* 2007a, Stvilia *et al.* 2008)? The treatment of the information within the articles also has to be considered: is the length of the articles adequate (Sheehy 1986)? Has the author thoroughly covered the subject (Stevens 1986)? Moreover, potential buyers should have a look at the number of illustrations and at the comprehensiveness of the items provided in various components such as the bibliography, or the index.

In the case of electronic and online reference materials, Singh (2003) insists on the need to check whether the content is actually provided within the material or if there are only links to external web sites. In addition, Crawford (2001) reminds buyers to check the presence and quality of multimedia enhancements. Another aspect of completeness is related to the presence of features expected or desired in the typical reference materials. For encyclopaedias, such features could be: the bibliography (Kister 1986), the reading lists and study guides (Kister 1986, Crawford 2001), as well as the appendices and glossaries (Lang 1987) or the list of abbreviation, list of errata, and list of pronunciation (Sheehy 1986). About the bibliography and reading list in particular, Sheehy (1986) encourages potential buyers to check whether publications in foreign languages are included or not.

Clarity: An article within a reference material is expected to be readily accessible (Kister 1986) so this parameter focuses on the level of comprehensibility of the text: the readability (Lang 1987), the use of abbreviations and symbols (Katz 1992b), or the consistency of the spelling (Encyclopaedia Britannica Inc. 2006). Stvilia and his colleagues (2005a, 2007a,

2008) particularly insist on the importance of cohesiveness and consistency of the content. For this, they use four different expressions:

- “intrinsic naturalness” to indicate the extent to which the information is expressed using the conventional typified terms and forms *de rigueur* in the field;
- “intrinsic cohesiveness” to indicate the extent to which the content of the article really focuses on the same topic;
- “intrinsic semantic consistency” to indicate that the same terms convey the same concept and meaning throughout the same reference material; and
- “intrinsic structural consistency” to indicate that the various items within the same reference material are represented with the same structure, format and degree of precision.

In fact, similar recommendations are also made by other researchers: for example, when they remind buyers to have a look at the general structure of the article (Giles 2005) or when they talk about the importance of clear headings (Sheehy 1986).

Accuracy: This parameter also has various dimensions. At a superficial level, the text should be free of spelling and typographic mistakes (Singh 2003). But more importantly, a reference material should be free of factual errors and misleading statements. It is very important that reference materials accurately report what was said in the original publications (Singh 2003). As Giles (2005) emphasizes, a misinterpretation or misrepresentation of a concept is a serious error in encyclopaedia making. No key facts should have been omitted (Katz 1992b). Moreover, all facts should be presented with a high degree of precision (Stvilia *et al.* 2005a, 2007a, 2008). Kister (1981, p.42), however, reminds us that buyers have realistic expectations and warns: “errors in an authoritative reference material are disturbing, but not unexpected. To repeat: no encyclopedia, no matter how carefully edited, is immune from error. No encyclopedia is perfect”.

Reliability: This parameter focuses on the verifiability of the information provided and on the credibility of its presentation. Singh (2003) offers a very comprehensive range of strategies and one of his many tips is to check whether pieces of evidence supporting the information are discussed in the text, or if references are provided, at least. Singh also warns about information which

seems to have just been copied from other materials, so to verify the source of information is another way to check its reliability. Additionally, Singh encourages potential buyers to look for clues ascertaining why one should believe the information –in particular, for any indication that other people have already checked the information. Among the questions to consider are: Is it clear who has verified the info? Is there an editor who checked it? Was the content approved by an organisation? Which institution supports the information?

Many other researchers also cover those points (Kister 1986, Smith 2001, Stvilia *et al.* 2005a, 2007a, 2008). Talking about the verifiability of information, Sheehy (1986) particularly insists on the importance of the bibliography which should serve as “sources for the authority of the article and for additional information?” whereas, talking about the credibility of the presentation, Lang (1987) writes that the information should be presented in a way which is believable and easy to accept but not just as a list of facts.

Objectivity: The balance in the choice of subjects to cover should obviously be checked (Sheehy 1986, Crothers 2008), but so should the balance in the treatment of information. Considering this latter aspect, the text should be free of stereotypes (Kister 1986), free from bias against race, gender, etc. (Crawford 2001). Moreover, the text should be written in neutral language (Crawford 2001) and all viewpoints should be presented in a fair/impartial way, particularly in the case of controversies (Lang 1987, Crothers 2008). Any sign of propaganda or advertisement (Singh 2003), any indication that the author may have some vested interest in the issue (Katz 1992b) may be seen as a lack of objectivity.

The American Library Association (1996, p.8) warns that, “space limitations in encyclopaedias makes it a lengthy presentation of all points of view on controversial topics impossible. We depend on the editorial judgment of encyclopedia editors to present a balanced picture”; however, there is a general expectancy that “most articles represent mainstream thinking”.

In opposition to others researchers, *Encyclopaedia Britannica's* staff (2006, p.4) state that expressions of personal point of view should not always be seen as negative in reference materials. They cite the practice used in *Britannica's Yearbooks* where “authors are often given greater latitude to express personal

views” and allowed to use “phrasing in which point of view figured significantly” because they are “entitled to his or her opinion about how a point might best be presented”.

Currency: Reference materials rapidly get outdated; therefore, potential buyers are strongly advised not only to consider the year of publication of the volumes (Singh 2003) but also to check the information provided which should be reasonably current (Smith 2001, Crothers 2008, Lichtenstein and Parker 2009). As a concrete guideline, Katz (1992b) indicates that “a timely reference material will be one that contains information dating from six months to a year prior to the copyright date”.

In fact, it is not rare that revised or new editions of existing reference materials are published; although, in some cases, a system of continuous revision is used instead. Checking whether the reference material to be purchased falls into one of these categories facilitates the assessment of the currency of the content (Sheehy 1986). For revised and new editions, a comparison with the previous editions is recommended to evaluate the lapse of time between editions (Large 1989, Giles 2005) and the amount of information brought up to date. Katz (1992b), as well as the American Library Association (1996), indicate that most large encyclopaedias claim to revise about 5 to 10 percent of their material each year. In all cases, the consistency of the updates needs to be checked so that changes are not limited to the text but are also made to other features such as the illustrations, the bibliography, the supplements in printed materials (Sheehy 1986), or the links in electronic ones (Singh 2003).

Stability: Beyond the need for the information to be current at the time of publication, some researchers have expressed the need for the information provided to also remain valid for quite some time. This is what Lang (1987) calls durability. Stivia and his colleagues (2005a, 2007a, 2008) are looking at the same issue from a slightly different perspective and insist that information provided in reference materials should not be too volatile over time. In the case of *Wikipedia*, they, for instance, indicate that the median revert time between edits can be used practically as an indication of such volatility (Stivia *et al.* 2005b).

Informativeness: Here, potential buyers are particularly encouraged to evaluate the contribution of illustrations for the general understanding of an article. For example, Stevens (1986) encourages buyers to start by asking whether illustrations should or should not be provided in a specific work. When illustrations are provided, the key question is to ask to which extent the choice was done judiciously (Kister 1986, Smith 2001) so that the illustrations actually amplify and explain the text and provide additional information (Singh 2003) instead of just serving simple aesthetic purposes (Sheehy 1986) or even distracting from the actual content and forming “noise” (Stvilia *et al.* 2005b). In the case of electronic and online materials, the concept of informativeness can also be applied to the links which, as Singh (2003) recommends, should lead to websites providing useful information.

Representativeness: The last parameter to use when checking the quality of content is what I call representativeness. This parameter relates to the conformity with the general expectations regarding encyclopaedias, as well as the conformity with conventions specific to the subject field. This parameter is mostly discussed by Stvilia and his colleagues (2005a, 2007a, 2008) who use the terms “representational semantic consistency” and “representational structural consistency” to indicate that the vocabulary used to refer to specific concepts and meanings on the one hand, the structure and format used to present information on the other hand, both follow some external standards.

Category 4. Information retrieval

The vast amount of information provided in reference materials is useless unless the readers can easily locate it. Three parameters can be considered to assess the quality of the information retrieval in place:

- Arrangement of the encyclopaedia content, and
- Search device available.

Arrangement: Publishers try their best to organise the content of reference materials in a systematic fashion, particularly the various articles. Alphabetic and thematic are the most common forms of arrangement for encyclopaedia articles (Katz 1992b, Smith 2001) but there are other alternatives such as logical, geographical, or chronological, to name but a few (Shores 1939, Smith

2001). It is important to check that the same arrangement is adopted throughout the entire work; so not only in the main body of articles in an encyclopaedia but also in the supplementary materials and in the yearbooks (Sheehy 1986). Another point to consider is the arrangement of other items such as the illustrations, cross-reference and bibliography which could be situated adjacent to the relevant article or grouped in other places within the reference material (Sheehy 1986, Katz 1992b).

Search device: Publishers also use special devices such as detailed tables of contents, cross-referencing system, or indexes to help reader locate information from reference materials (Shores 1939, Sheehy 1986, Lang 1987, Katz 1992b). In the particular case of electronic and online materials, publishers may also use hyperlinks and search engines (Singh 2003) as well as other retrieval tools such as the Dewey Decimal Classification (Large 1989). In all cases, it is worth potential buyers checking which types of devices are provided.

The effectiveness of both the arrangement of the encyclopaedia content and the search device should be evaluated (Lichtenstein and Parker 2009). In particular, potential buyers of reference materials are encouraged to ask questions such as: how easy it is to find information solely by relying on the arrangement and the titles and headings provided (Sheehy 1986, Stevens 1986, Crothers 2008) or by using devices such as the table of content, cross-references and the index. For electronic and online materials, not only the search engine (Singh 2003) but also the interface design and the layout of the query boxes and navigation buttons (Crawford 2001) play important roles in helping the users find their way through the content. In fact, they should be straightforward and intuitive, so even basic users should be able to use them (Starr 1994).

Category 5. Encyclopaedia delivery

Three parameters are used to assess the quality of encyclopaedia delivery:

- Format of publication;
- Efforts to increase the user-friendliness of the encyclopaedia; and
- Cost.

Format: This is undoubtedly the first thing that buyers will notice in a reference material (Katz 1992b); namely, is it published in print or in electronic and online format (Large 1989, Katz 1992b, Crawford 2001)? In the case of electronic materials, the type of platform and software used may also influence the buyers' decision to proceed with the purchase or not (Smith 2001). Some formats may not be appropriate to all buyers, for example, not everybody has access to a computer with appropriate software or online facilities (Singh 2003) and not all libraries have microfilm readers (Smith 2001). Even for reference materials in printed forms, considerations need to be made regarding the suitability for heavy use, which require the use of high quality paper and inks, and sturdy bindings (Sheehy 1986, Lang 1987).

User-friendliness: This concerns the efforts to make the use of reference materials easier for the targeted audience. In the case of printed materials, considerations could be made to the typography, the size of the characters, the layout and density of the text (Lang 1987, Katz 1992b). For multi-volume materials in particular, any help in locating the proper volume is also welcome: for example, are the volume numbers clearly indicated on the spines (Sheehy 1986)? In the case of electronic and online materials, the user-friendliness of the design (Crawford 2001) and preview functions (Large 1989) are also important. Additionally, potential buyers are reminded to check the support for users provided, such as the assistance through customer services (Large 1989).

Costs: Finally, the price of the purchase or subscription to the reference material has to be considered. Some of the subscriptions sometimes have a complicated charging policy which needs to be checked (Large 1989). Also, one has to ask not only whether the price is within one's budget (Crawford 2001), but also whether the price is actually fair (Kister 1986).

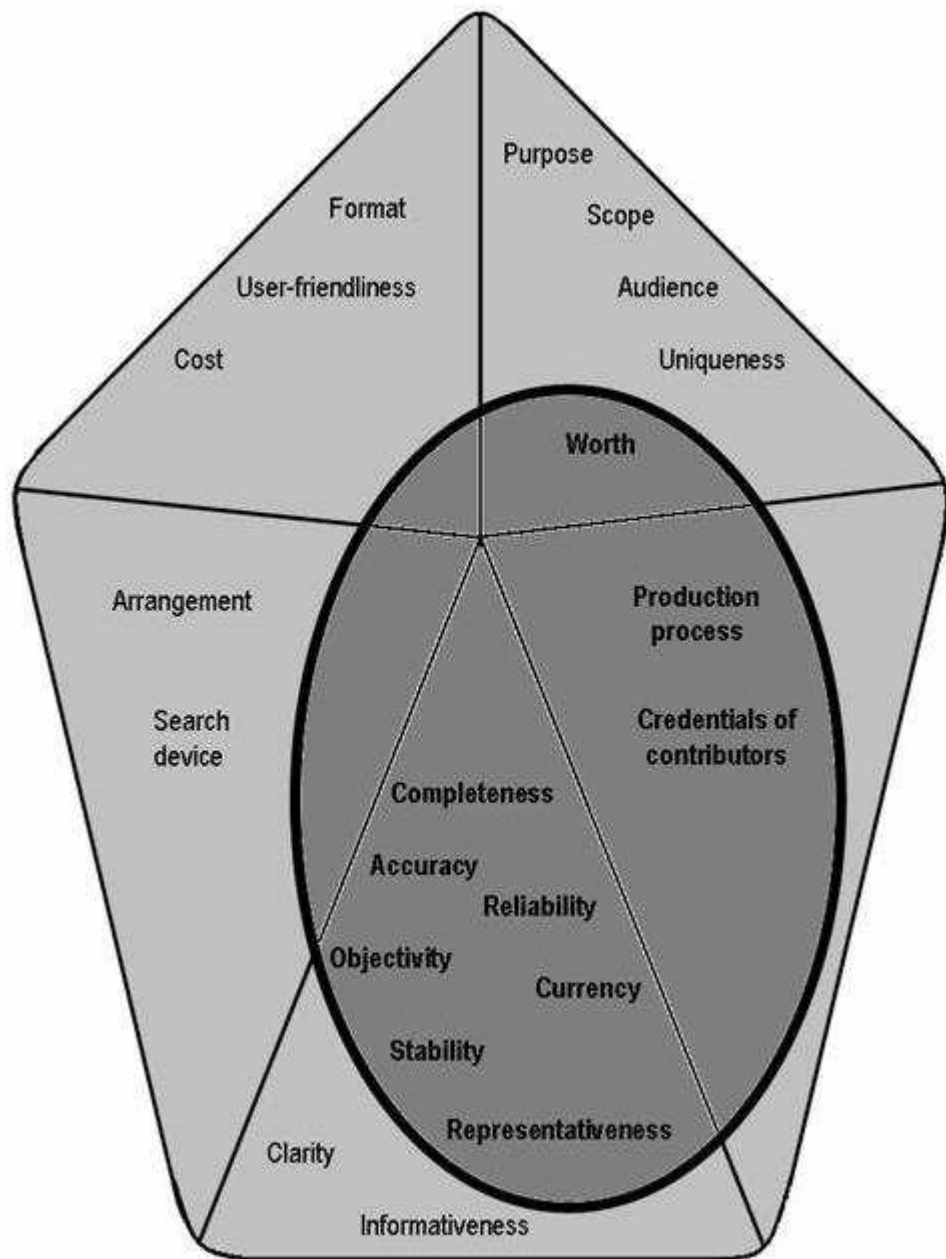
4. Towards and understanding of encyclopaedia authority in general

If it is agreed that, in the context of encyclopaedias, the concepts of authority and quality are considered interchangeable, authority can then be defined along the same five categories discussed within this chapter. Each of these categories is composed of many parameters –22 in total– although Categories 1 (Importance within the publishing industry) and Category 3 (Encyclopaedia

content) have relatively more parameters than the others. With as many as nine parameters to consider –*completeness, clarity, accuracy, reliability, objectivity, currency, stability, informativeness, and representativeness*– the attention of the library and information specialists seems particularly focused on the encyclopaedia content. The next most important category is the one focusing on the importance of the work within the publishing industry, with six parameters (*purpose of the work, scope of the coverage, targeted audience, worth for the audience, aesthetic aspects, and uniqueness*). Most of the parameters within these two categories require complex analysis. For example, to assess the *completeness* of an encyclopaedia entails looking not only at the comprehensiveness of the subject coverage within the entire work but also at the length and depth of the treatment of topics within the articles, the amount of illustration, the comprehensiveness of the bibliography, cross-reference, the index, the presence or absence of reading lists, appendices, glossaries, etc. By contrast, assessing encyclopaedia quality –and authority– from the perspective of the production process, of the information retrieval or of the information delivery seem much simpler, with fewer parameters to consider and less complex analysis to conduct. For example, looking at the *cost* of a particular reference material or encyclopaedia (a parameter which falls under the Delivery Category), a potential buyer only needs to ask three questions: What exactly would I be paying for? Is it a fair price? And can I afford it? etc.

The literature reviewed in this chapter also indicates that the term authority is sometimes used with a narrower meaning. Based on the occurrence of the word “authority” within existing frameworks for quality assessment, authority can indeed be considered a subset of quality. Yet, even among library and information specialists, there seems to be no ultimate agreement about what that meaning is. With the exception of Lang (1987) and Crothers (2008), all authors of the publications listed in Table 1, in fact, mention the concept of authority in one way or another. For example, when Kister lists *uniqueness* as one of his parameters, he suggests that the authority of the encyclopaedia under consideration is compared with the authority of competitors. He, however, does not specifically define what he means by the authority.

Additionally, several frameworks had a parameter specifically labelled *authority* which actually referred to one or several parameters already described in Section 3 of this chapter and summarised in Figure 3.



In darker shades are parameters with special mention to the words "authority" or "authoritative"

Figure 3. Occurrence of authority within the framework for quality assessment

- For Lichtenstein and Parker (2009), *authority* is simply the *credentials of the authors* whereas, for Stevens (1986) and Martin (1992), the *credentials of the editors and publishers* are also included.

- For Katz (Katz 1992b) and Large (1989), it is the combination of the *credentials of both the authors and publishers*, and the *objectivity* of the content which defines *authority* in reference materials. In the particular cases of encyclopaedias, Katz (1992b) adds that there is a general expectation not only for *objectivity* but also for *accuracy* and *currency* of the content, including the meaningful update of the information even after the actual authors had passed away.
- The *credentials of all contributors* associated with the *currency* of work (including the revision history) define *authority* according to Shores (1939).
- On the other hand, Starr (1994) and Smith (2001) use the parameter *authority* to indicate both the *credentials of the contributors*, particularly the publishers, and the *reliability* of the content provided.
- This last definition is relatively close to the definition adopted by Singh (2003) who insists more on the *credentials of the authors*, and who adds a third parameter, which is the quality of the *production process*, particularly the importance of the peer-review.
- For Crawford (2001), the parameter *authority* is literally used as synonymous of “the staff responsible for the content” and of the “worthiness” of the reference material. At the same time, Crawford insists on the importance of the intervention of editorial staff and the respect for editorial standards *de rigueur* in reference materials as signs of authority. So, compared to the list of parameters described in previous section, Crawford’s authority encompasses the *credentials of the editors*, the thoroughness of the *production process*, the *worth* of the work, and the *representativeness* of the content.
- Stvilia and his collaborators (2005a, 2007a, 2008) generally define *authority* based on the degree of reputation within a given community. However, in a paper where they develop some information quality metrics to be used for *Wikipedia* (Stvilia *et al.* 2005b), they suggest that *authority* can be measured based on the number and profile of contributors (which are equivalent to the *production process* and *credentials of the contributors* respectively), on the number of external links (which indicate the reliability of the content), and on the number of reverts (which indicates the *stability of the content*).

- But the most complex definition of authority is from Sheehy (1986) who not only considers the credentials of the various contributors and the thoroughness of the production process, but also dedicates a lot of attention to most aspects of the content: its *completeness*, *accuracy*, *objectivity*, *currency*, *stability*, and even its *representativeness*.

In sum, when not considered synonymous with quality in general, *authority* is associated with the *credentials of the contributors* and with the thoroughness of the *production process* (Category 2); with any one of the parameters which are defining the quality of the content with the exception of *clarity* and *informativeness* (Category 3); and finally with the *worth* of the encyclopaedia (Category 1). By contrast, the concept of authority seems to be alien to any discussion on information retrieval (Category 4), on information delivery (Category 5), on the parameters used to define the importance of the work within the publishing industry (Category 1) —with the obvious exception of *worth*.

Both the previous chapter and this one have been largely theoretical discussions. The ideas covered in these two chapters are revisited and combined in Chapter 5 which reviews previous research pertaining to the authority and quality of encyclopaedias and focuses particularly on the case of *Wikipedia*.

CHAPTER 3.

METHODOLOGY

This thesis is a case study focusing particularly on encyclopaedias in the 20th and 21st centuries. A case study approach is most appropriate when the emphasis is more on learning the different facets of the object of the study than on trying to generalise beyond this (Stake 2005, p.3, Thomas 2010, pp.17-23). Additionally, Yin (2003a) posits that a case study should be used when the following three criteria are met:

- the research question is in the form of “how” and “why”;
- the researcher has little control over events; and
- the focus is on a contemporary phenomenon.

The current thesis meets the requirements above. As mentioned in the Introductory Chapter of this thesis, my interest focuses on encyclopaedias. In fact, it can be said that encyclopaedias are here considered as an “intrinsic case study” –as opposed to an “instrumental case study” which are cases selected for the investigation of a general phenomenon (Stake 1995, p.3, Stake 2005, p.445). As also mentioned in the Introductory Chapter, the thesis research question is: How is encyclopaedia authority established?, a complex question which begs in-depth analyses from various perspectives and which goes beyond what simple surveys can answer. The fact that I am studying contemporary encyclopaedias that other people have developed satisfies the last two criteria listed by Yin.

1. Research design

As is the case for any topic, studying encyclopaedia authority can be conducted in many different ways (Figure 4). Just from the various discussions in the previous chapters, it is clear that encyclopaedia authority can be seen through at least three different lenses or perspectives: from the perspective of

encyclopaedia users such as the librarians, students and teachers; from the perspective of the encyclopaedia developers such as the authors and editors; and from the intrinsic properties of the encyclopaedia itself, particularly the quality of its content. Other theories can also bring additional perspectives. In fact, considering the complexity of both the concept of authority and the world of encyclopaedias, the perspectives are innumerable. Each of these perspectives can highlight specific aspects of encyclopaedias and, once taken in consideration with other perspectives, can lead to a greater understanding of the issue at hand. Ultimately, the final choice of how to conduct the research depends on a variety of factors.



Figure 4. Perspectives contemplated for the study encyclopaedia authority

I would describe myself as a pragmatist. In line with the pragmatist worldview (Creswell and Plano Clark 2007, pp.22-26, Creswell 2009, p.12), I was dedicated getting the most complete understanding of the issue at hand by choosing my approaches based on what I found appropriate and feasible for the

circumstances. I could have conducted my research from any one of the perspectives listed above but I chose to study encyclopaedias from many different perspectives. This decision was based on the knowledge that empirical research on encyclopaedias (besides *Wikipedia*) was so scarce that it would be more useful to conduct a more exploratory study which would open up the stage for future in-depth explanatory and predictive studies (Kane and O'Reilly-de Brún 2001, pp.34-35). Traditionally, exploratory studies could be quantitative or qualitative (Cohen *et al.* 2000, Bryman 2004) but true to the pragmatism view, I keenly mixed the two methods. In fact, I so fully embraced the recommendations from Leedy and Omrod (2001, p.92) –who said: “any good researcher must be eclectic, willing to draw on whatever sources seem to offer productive methods or evidence for resolving the research problem”– that I dedicated a lot of time at the beginning of the PhD to testing different methods.

1.1. Studies contemplated

Several alternatives were explored before the research design was finalised.

Exploring the issue of quality and authority within *Wikipedia* was my initial plan for the PhD. I wanted to conduct a virtual ethnography, combining methods used by various researchers such as Markham (1998), Hine (2000), or Crichton and Kinash (2003). As a researcher, I would immerse myself into *Wikipedia* and not only reflect on my own experience there but also research other *Wikipedia* users. Considering the amount of time needed for me to master the technicalities of *Wikipedia* before I could full participate, I thought it may be better for me to look for other alternatives.

My next step was to contemplate more traditional ethnographic studies (Gennari *et al.* 2004, O'Reilly 2005). Aware of the extraordinary reputation of some of the encyclopaedia publishers, I turned my attention to some of the ones based here in the UK. I particularly wanted to observe the various editors at work and how they collaborated with the authors. Securing entries within the elite organisations is one of the major challenges in ethnographic studies (Hertz and Imber 1993) and I could not secure one myself. Smaller publishers could have been easier to approach but they did not always have encyclopaedias under development.

There were also some discussions regarding the possibility of my joining a group of Malagasy scholars who were trying to develop a national encyclopaedia in my own country, Madagascar. This encyclopaedia had been envisioned for many years but struggled to become a reality. I started to plan action research with these scholars (Coghlan and Brannick 2001, O'Brien 2001) with the intention to work with them in the search for ways to overcome existing challenges and to bring the encyclopaedia into completion. Unfortunately, political unrest which started in the year 2008 brought all activities in Madagascar to a halt, including the encyclopaedia project. Considering the impossibilities of working directly with publishers, editors and authors, I finally resorted to conducting a survey and to invite some of them to reflect on their past experience with encyclopaedia development. The details of this study are discussed in Section 3.2 of this chapter.

By that time, I also realised I had to look for other alternatives which could be conducted within, or from, the University of Glasgow. I tried to investigate the use of encyclopaedias by the users of the University Library from a combination of two methods suggested by Ford (1990): the direct observation of library users and the analysis of book circulation. The first method happened to be unrealistic because students seemed to rarely check the printed volumes from the reference shelf (preferring probably to look-up information online). The second method also had to be abandoned. Because of constraints imposed by publishers and online providers, I could not use the data obtained from the Lending and Subscription Services at the University. Unable to directly investigate the public use of encyclopaedia within a specific library, I decided to look at the dissemination of encyclopaedias throughout many libraries. That study was included in the thesis and the methodology followed is described in Section 3.1.

The analysis of published documents was another alternative which could be conducted from my desk. I had used content analysis in previous research and I was familiar with the handling and coding of the voluminous data generated during the process (Krippendorff 2004). Different types of documents were contemplated. For instance, the marketing materials that publishers leave on their website to advertise encyclopaedias could provide an indication of the importance allocated to the concept of authority and quality. The comments left by encyclopaedia buyers on various online forums and commercial websites such

as Amazon.com could also be used to assess the general perception of published encyclopaedias. In both cases, however, difficulties in locating a substantial number of the documents and issues with objectivity and authenticity of the content of these latter could put the validity of the analysis into jeopardy (Stemler 2001). Eventually, I managed to look at the documents with editing guidelines that publishers made available to authors in the case of five encyclopaedias. Considering the very small sample, this analysis was not included in the main thesis but is made available in Appendix 2. What was considered instead was the content analysis that book reviewers wrote on encyclopaedias as described in Section 3.3.

1.2. Studies completed

At the end of this long exploratory process, it was clear that it would be possible for me to conduct three distinct empirical studies (Figure 5):

- The encyclopaedia dissemination through various libraries;
- The authors' experience of encyclopaedia development; and
- The reviewers' assessment of encyclopaedia quality.

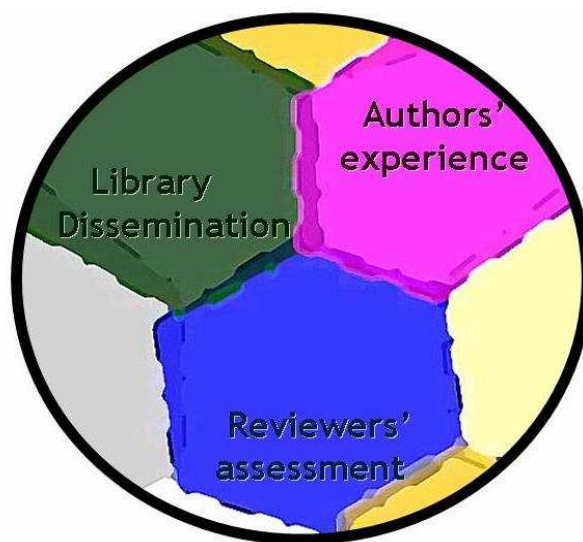


Figure 5. Perspectives chosen for the study of encyclopaedia authority

The research then fell within what would be called an “embedded case study design” (Yin 2003a, pp.40-45, Stake 2005, p.451) whereby the main case consists of encyclopaedias in general and the embedded subunits consist of three distinct

aspects of this main case –the three empirical studies just mentioned above. The subunits or perspectives were explored separately from one another using different methods –a flexibility which is allowed in an embedded case study (Scholz and Tietje 2002, p.9)– but all findings had to be directed towards an understanding of the main research question; namely how encyclopaedia authority is established.

Scholtz and Tietje (2002, p.11) write that “exploratory case studies help to gain insight into the structure of a phenomenon in order to develop hypotheses, models or theories”. That was exactly what I intended to achieve through the thesis; yet, the adjective “exploratory” is taken in its most general meaning and exploratory case study is simply equated to “a prelude to some social research” (Tellis 1997). Yet, I did not manage to follow the typical steps described in the literature on how most exploratory case studies are conducted. Indeed, the first step in such studies generally consist of initial fieldworks towards gathering basic facts and the formulation of potential hypothesis (or solution to a problem) which are then tested in the next steps of the studies (Thomas 2010, pp.104-109). I had originally designed the study of the encyclopaedia development in such a way that basic facts were to be collected through a survey questionnaire sent to encyclopaedia authors before further investigations were to be conducted through telephone interview with the same authors. Only the first step was completed (See Section 3.2.f). In fact, throughout the thesis, I let theories on cognitive authority and quality define the framework of the research and specify what is to be explored regarding encyclopaedia authority within each of the subunits of analysis (Yin 2003b, pp.4-8). Details on how the various studies conducted during the thesis are provided in later sections of this chapter.

2. Description of contemporary encyclopaedias

When I used the word “encyclopaedia”, I referred to a genre of publication and implied that there was more than one publication to study. My main focus is encyclopaedias published in the 21st century, but when needed, I also looked at encyclopaedias published in earlier centuries.

2.1. Background information

In an attempt to describe the encyclopaedia world, simple literature reviews were conducted (Hart 1998, Fink 2005) on three topics:

- The historical background on encyclopaedia, including inventories of past encyclopaedias from the 5th century BCE to the mid-20th century;
- The previous research on encyclopaedia, particularly on *Wikipedia* which is the most researched contemporary encyclopaedia;
- The challenges facing encyclopaedias in the 20th and 21st centuries.

Locating the publications to review was done through an Internet search followed by a check through the bibliographic reference of various papers found. Considering the relative scarceness of the research on encyclopaedias (the exception concerns past research on *Wikipedia*), all publications that I managed to find were checked. Two questions were used to decide whether the publications found were to be included in the review.

- What is said about encyclopaedia development, encyclopaedia authority of encyclopaedia quality?
- What is said about the place and use of encyclopaedias in society?

This last question was later narrowed down into “What is said about the place and use of encyclopaedias in libraries?” due to lack of publications in other areas of society. The findings from the literature review are summarised in Chapter 4, Chapter 5, and at the beginning of Chapter 6.

2.2. Inventory of the contemporary encyclopaedias

There is no single inventory comprising all published encyclopaedias so I had to conduct my own from the analysis of bibliographic databases as a source of secondary data (Vartanian 2011). I chose WorldCat which is supposed to be the world’s largest searchable online database with bibliographic records in hundreds of languages and in all formats, including electronic resources and digital objects¹³. WorldCat is indeed operated by the Online Computer Library Center –or OCLC– which is a non-profit organisation gathering more than 72,000

¹³ See www.oclc.org (accessed on August 31st 2010)

institutions in 170 countries and territories.¹⁴ Looking into the WorldCat database is equivalent to looking into the library catalogues of all these OCLC institutions. Technically, each OCLC institution has the option of linking its library catalogues to the WorldCat database. Because this latter is available online to all subscribers and because it is partnered with major search engines such as Google and Yahoo! taking up this option is generally considered by OCLC institutions. Indeed, it increases the visibility of OCLC institutions and libraries and maximises Internet users' access to their library catalogues.¹⁵ In fact, the responsibility of OCLC is limited to dissemination of library catalogue; it is still the responsibility of librarians within each institution to build their library catalogues, to control the quality of the various bibliographic records, and to create the links to the WorldCat database.

Because English is now one of the most widely used languages throughout the world, encyclopaedias written in this language were chosen as the unit of analysis for the thesis. The general expectation was that an understanding of the trends and practices in these encyclopaedias could be of greater relevance and could have wider implications for the encyclopaedia making in general.

2.2.a. Selection of the unit of analysis

Using systematic sampling (Leedy and Ormrod 2001, pp.216,218), I used the search engine incorporated into the WorldCat database to find all bibliographic records in the English language which were published from 1900 to 2009 and which had the word “encyclopaedia” or “encyclopedia” in the title (Figure 6). In later stage of the study when I conducted more detailed description of actual encyclopaedia titles –as opposed to simple bibliographic records– I had to narrow down the unit of analysis to make the data collection more manageable. Eventually, I considered only the bibliographic records responding to the following criteria:

- written in the English language;
- with the word “encyclopaedia” but not “encyclopedia” in the title;

¹⁴ See <http://www.worldcat.org/whatis/default.jsp>.

Note that, although OCLC generally talks about «WorldCat Registry», I would instead talk about «WorldCat database» throughout the thesis for the sake of clarity.

¹⁵ See <http://www.worldcat/webservices/registry/xls/faq>

- published in printed format;
- published every ten years starting in 1900, or published during the year 2009 (2009 was chosen because it was the most recent data available at the time of data collection).

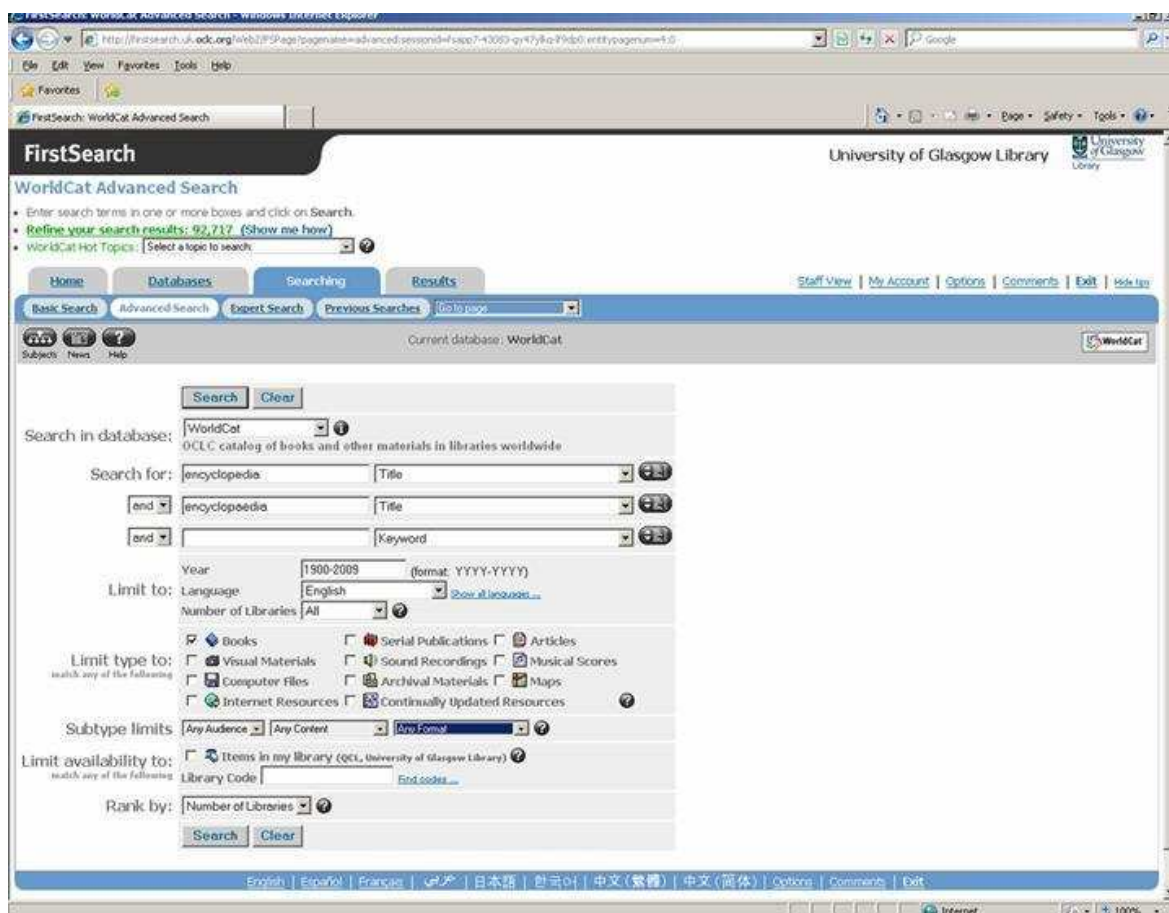


Figure 6. Screenshot of the search page of WorldCat

2.2.b. Data collection and data handling

The results of the search from the WorldCat database were exported into reference manager software –in my case, EndNote®– to facilitate the organisation and extraction of the data. For each of the bibliographic records pertaining to the first search, both the format of publication and the year of publication were directly obtained from WorldCat.

A look through the list of bibliographic records showed me that some of them were duplicates, which I then manually removed to get the list of unique encyclopaedia titles. This process was not applied to all English language

encyclopaedias found but only to the sub-sample mentioned above. For each of the unique encyclopaedia title, the publisher's name and the place of publication were obtained from the WorldCat records. I also manually classified each encyclopaedia title according to the Dewey Decimal Classification system (Dewey 1979).

2.2.c. Data analysis

Considering that this part of the thesis was just about describing English language encyclopaedias, I used simple descriptive statistics (Healey 2011, pp.22-62). For this, the data collected were entered into a spreadsheet within Microsoft Excel® which was also used to generate the table and figures summarising quantitative analyses throughout the thesis. Here, I also provided detailed descriptions of English language encyclopaedias by focusing particularly on the evolution of the format of publication, the country of origin and the topic coverage. Although I attempted to make some general predictions regarding the number of titles beyond the year 2009, I did not use any inferential statistics because the erratic fluctuations in the number of encyclopaedias published in recent years made such an approach inappropriate (Gayle 2000, Healey 2011, pp.142-146).

A small section of this study is also dedicated to evaluating the relative importance of these encyclopaedias within the WorldCat database. Here the list of bibliographic records on English language encyclopaedias was compared with the list of non-fiction publications in the English language and published during the same period of time (i.e. 1900 to 2009) —a list which is also obtained by searching the WorldCat database. A simple correlation analysis was used to see whether the number of records within the two lists evolved in the same manner or not. The findings of this descriptive study are summarised in Chapter 6, Section 3, starting on p.140.

3. Exploration of encyclopaedia authority

3.1. Study of encyclopaedia dissemination

The study measures encyclopaedia authority based on the understanding that the level of dissemination of a published text could be considered as a sign of its popularity among the general public,¹⁶ which in turn could increase its probability of being adopted as cognitive authority by its readers. The study not only tries to identify the libraries (and countries) where encyclopaedias are found, it also analyses the dissemination pattern. Once again, the analysis focused on the library catalogues of the 72,000 OCLC institutions as found in the WorldCat database.

3.1.a. Research questions

Two questions were considered for this study. The first question was: What is the dissemination pattern of the different encyclopaedia titles throughout the OCLC institutions? The hypothesis at the basis of this study is as follow: if all encyclopaedias are equally authoritative then they should have comparable levels of dissemination. The alternative hypothesis is that some encyclopaedias are more authoritative than others, the most authoritative being the one most widely disseminated. In this latter case, it is possible that authoritativeness and dissemination do not happen at random and that there are key factors determining both concepts. This leads to the second research question which reads: could any of the data available from the WorldCat database –such as the year of publication, the format, the origin, or the topic coverage– be a factor influencing the level of dissemination of encyclopaedias?

3.1.b. Selection of the unit of analysis

Considering the fact that I needed to manually compile the list of institutions holding each encyclopaedia title, I had to focus on a smaller sample than in the study just described above. Once again, a systematic sampling was adopted

¹⁶ See Chapter 1, Section 4.1.b on p.34

(Leedy and Ormrod 2001, pp.216,218) but this time, the library records considered in this study were selected according to the following criteria:

- written in the English language;
- with the word “encyclopaedia” but not “encyclopedia” in the title;
- published in printed format (but could also be simultaneously released in alternative format);
- published between the years 2000 and 2009;
- fell under Category 500 (i.e. Science) and Category 600 (i.e. Technology) in the Dewey Decimal Classification system.

3.1.c. Data collection

For each of the library records included in this part of the thesis, data similar to those used in the previous study were collected: i.e. year of publication, format of publication, name of the publisher, place of publication. In addition, the list of OCLC institutions holding each library records was obtained from the WorldCat page, along with the location of the institution. (See for Figure 7 an example). Like in the previous study, the country of publication and the Dewey Decimal Classification had to be assigned manually.

3.1.d. Data analysis

I started with a descriptive analysis of the science and technology encyclopaedias following the same methodology as in the previous study.¹⁷ I then computed the number of institutions holding each encyclopaedia title before analysing the dissemination pattern. More specifically, I looked at the average number of institutions and countries reached by the encyclopaedias before testing whether these numbers varied based on format of publication, the year of publication, the country of publication, the name of the publisher, or the topic coverage.

¹⁷ See Section 2.2.c on p.70

FirstSearch University of Glasgow Library

Libraries that Own Item

This screen shows libraries that own the item you selected.

Home Databases Searching Results Staff View My Account Options Comments Exit Help

List of Records Detailed Record Marked Records Saved Records

Current database: WorldCat Total Libraries: 12

Title: International encyclopaedia of global warming and climate change Author: Suni, V S Accession Number: 226659515

Libraries with Item: "International encyclopaed..." (Record for Item | Get This Item)

Location	Library	Code
CA,ON	UNIV OF GUELPH	UGG
Hong Kong	UNIV OF HONG KONG	HUA
India	OCS HARYANA AGRI UNIV	INCCS
India	D.K. AGENCIES LTD	DKAGE
India	INDIAN AGRICULTURAL RESEARCH INST	INARI
India	UNIV OF AGRI SCI	INJAS
Mexico	UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO	UNAMX
South Africa	DURBAN UNIV OF TECH	TZN
South Africa	UNIV OF PRETORIA	PA4
US,CA	ALIBRIS	ALBR5
US,NH	YBP LIBRARY SERVICES	YDX
US,PA	PENNSYLVANIA STATE UNIV	UPM

Record for Item: "International encyclopaed..." (Libraries with Item)

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- Libraries worldwide that own item: 12
- Search the catalog at University of Glasgow Library

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More Like This: Search for versions with same title and author | Advanced options...

Title: **International encyclopaedia of global warming and climate change /**

Author(s): **Suni, V. S.**

Publication: New Delhi : Anmol Publications.

Year: 2008

Description: 2 v. (iii, 531 p.) ; 25 cm.

Language: English

Standard No: ISBN: 8126134301 (set); 578812613-809 (set)

SUBJECT(S)

Descriptor: **Global warming -- Encyclopedias.**
Climatic changes -- Encyclopedias.

Note(s): Includes bibliographical references (p. [468]-527) and index.

Class Descriptors: Dewey: **551.6:QC981.8.G55**

Other Titles: **International encyclopedia of global warming and climate change Global warming and climate change**

Responsibility: V. S. Suni [editor].

Vendor Info: YBP Library Services D.K. Agencies(P) Ltd. (YANK DKAP)

Document Type: Book

Entry: 20080436

Update: 20090605

Accession No: OCLC: 226659515

Database: WorldCat

Current database: WorldCat Total Libraries: 12

English Español Français العربية 日本語 한국어 中文(繁體) 中文(简体) Options Comments Exit

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Figure 7. Screenshot of the data provided for one example of library record within WorldCat

The case of the encyclopaedias which appeared to be more popular than others was then analysed separately. Here, popular encyclopaedias were those which reached comparatively more institutions and countries than others, although the cut-off limits were decided somewhat arbitrarily. Indeed, the popular titles appeared as outliers in the scattergram of encyclopaedia dissemination but no

statistical test was conducted to test whether there was a significant difference between popular and less popular encyclopaedias. In fact, no inferential statistics were used in this study because, most of the time, the data violates the requirements of most statistical tests (either the size of population within the different categories were too small or too unequal, or the distribution were too skewed) (Healey 2011, pp.142-156). The findings of this descriptive study are summarised in Chapter 7, Section 2, starting on p.162.

3.1.e. Limits of the methodology

The quality of the research depends on the quality of the data (Hense and Quadt 2011). This adage particularly rings true when the study was based on WorldCat as a source of data. Indeed, an incredible amount of work was needed to remove duplicated library records and limits in human attention prevent the task from been performed perfectly.

The level of accuracy of the information provided in WorldCat also prevented the current study from reaching its full potential. In particular, lack of precision in the name of the publisher and in the place of publication may have affected the outcome of the analysis of the factors influencing the level of dissemination of the science and technology encyclopaedias. It was also the quality and quantity of the data collected which prevented the use of factor analysis; this approach could have highlighted any interaction between the different factors in their influence over the dissemination pattern.

3.2. Study of encyclopaedia development

This study investigates to the extent to which establishing authority was at the heart of encyclopaedia development. This qualitative research was based entirely on the perspectives of the encyclopaedia authors (Kane and O'Reilly-de Brún 2001, pp.35-37, Leedy and Ormrod 2001, pp.147-148).

Knowing that encyclopaedias authors are typically 'elite' people with very busy schedules, I had to ensure that the study was designed in a way that I could get a maximum amount of information from a very short interaction with them. As Thomas (1993, p.88) writes about researching 'elite' people, "it is essential to

make the most of the event.” I felt compelled to conduct a pilot study before finalising the design of the study.

3.2.a. Pilot study

My original plan was to conduct an in-depth interview with the encyclopaedia authors (Marshall and Rossman 1995, pp.80-81). I prompted the authors to describe their experience of writing encyclopaedia articles with the expectation that, through this process, the authors’ views on encyclopaedia authority and quality would unfold.

There were two points that I particularly wanted to test through the pilot study. I had to ensure that the questions were

- broad enough to give the authors room to express themselves with minimum influence from my side; and
- direct enough to ensure that the authors could immediately engage with the topic of encyclopaedia development and offer detailed responses.

This last point was of particular concern since the act of writing includes a lot of tasks which are done automatically and which may be difficult to reflect upon (van der Geest 1996). One typical example of question used for the pilot study was: “How did you define quality in the last article you wrote? And what did you do to achieve this quality?”

The pilot study was conducted with 16 members of staff throughout the University of Glasgow. Not all of them had experience writing encyclopaedia article; in which case, they were asked to describe their experience with any piece of writing they had published in the past. In 30 to 45 minute interviews, I usually managed to receive very detailed answers from my interviewees. Although all answers were pertinent to encyclopaedia development, their extreme diversity made the identification of common themes difficult. Moreover, the interviewees eagerly discussed the “how to do” part of the writing experience but rarely explicitly addressed the issue of quality and authority.

My conclusions from the pilot study were as follow. Firstly, it may not be necessary to have long interaction with my participants to get detailed

responses. Secondly, I would need to frame the discussion into a narrower context, one where explicit discussion of the concepts quality and authority would be inevitable.

For the actual study, I decided to start with a survey questionnaire for an initial exploration of the general views of encyclopaedia authors on encyclopaedia authorities and quality. Follow-up interviews would then be conducted with selected authors to explore even further some of the key ideas raised. In these two stages of the research, I decided that the questions would focus particularly on the authors' experience of writing encyclopaedia articles on uncertain and controversial topics. Indeed, the role of text as cognitive authority is most demonstrated in the context of uncertainties and controversies. Moreover, achieving quality writing on such topics would require more conscious decisions from the encyclopaedia authors who would then be in a better position to reflect and articulate the link between the act of writing and their understanding of quality.

3.2.b. Research questions

The questions considered for this part of the thesis were:

- What are the authors' views regarding the role of encyclopaedias and the nature of encyclopaedic knowledge?
- What are the authors' objectives while writing encyclopaedia articles?
- What are the authors' approach to the communication of scientific uncertainties and controversies?

According to the theory of cognitive authority, the intention to go beyond the mere communication of facts and information and to provide the reader with guidance in times of uncertainties and controversies could be considered as a sign that encyclopaedias have the potential to serve as cognitive authorities.

3.2.c. Selection of the unit of analysis

There are many topics which are rich in scientific uncertainties and controversies (SU&C). I decided to focus on encyclopaedias on global warming and climate change (hereafter GW&CC) for a variety of reasons. My educational background would allow me to understand the articles written on the subject

and to engage better with the research. More importantly, GW&CC is an issue at the heart of modern societies that no one can overlook. Both the general public and the policy makers need help to deal with the fragmentary and contradictory information on GW&CC that the media and the scientific community are bombarding them with.

For this part of the thesis, I needed to have continuous access to the actual encyclopaedias to study in order to identify the encyclopaedia authors and to be able to read the articles they have written. A combination of a purposive and convenience sampling was adopted (Leedy and Ormrod 2001, pp.218-219). Indeed, I targeted encyclopaedias on GW&CC which were published in 2008, exactly one year after the publication of the highly talked-about *Fourth Assessment Report* from the Intergovernmental Panel on Climate Change. I particularly wanted to make sure that encyclopaedias of diverse format ended up in my sample, including the prestigious *Encyclopaedia Britannica* and the highly popular *Wikipedia*. For the printed encyclopaedias, I was limited to the titles which were made available to me through the library of the University of Glasgow.

All encyclopaedia authors who contributed articles on GW&CC from the encyclopaedias aforementioned were targeted. In the case of *Wikipedia*, considering the high number of collaborators, I had to focus on the most active authors.¹⁸

3.2.d. Data collection

A one-page survey questionnaire was designed for the study (Gillham 2000). The length, the layout and the formulation of the questions were deliberately defined to facilitate the filling of the questionnaire by busy respondents (Kane and O'Reilly-de Brún 2001, pp.155-167). At the beginning of the questionnaire authors are asked to provide their name and institution, to indicate the encyclopaedia they had contributed to, and to name one of their articles they

¹⁸ *Wikipedia* contributors were identified from the Statistic data provided under the Page History associated with each article. For this study, “most active” authors were arbitrarily defined as those who contributed to 10 or more articles on GW&CC and those who contributed to less than 10 articles but whose average contribution exceeded 10 edits per article

wanted to reflect on. The actual questions are divided into two categories: the first category investigates the nature of knowledge and the goal of encyclopaedia, whereas the second category focused on the communication of scientific uncertainties and controversies (SU&C).

There are nine questions in total (See Appendix 1 for a copy of the survey material). The first two questions are quantitative and enquired about the authors' views on the nature of knowledge within the topic of their article, as well as their views on how that knowledge should be presented in encyclopaedia. The remaining seven questions are qualitative and are listed below:

- *Why* do you think knowledge in encyclopaedia article should be presented in that way?
- What were you trying to achieve through your article and what effect do you hope it will have on readers?
- Please give *examples* of SU&C pertaining to the topic of the article above and explain *why* these are SU&C.
- *Which*, if any, of these SU&C did you cover in the article above, and *why*?
- Which *challenges* did these SU&C impose when you were writing the article?
- Which *strategies* did you adopt to address these challenges? For instance, how did you write about SU&C?
- Is the experience described above *typical* of how you usually approach SU&C?

The survey questionnaire was then emailed to the encyclopaedia authors whose email addresses were obtained from the Internet (for example, on personal blogs or on institutional websites). In the case of *Wikipedia*, authors were contacted via the email function and via messages left on the Talkpage of their Userpage. The participants were given one month to return the questionnaire. After an initial analysis of the survey results, the preliminary report was sent to the participating authors who were then invited to make comment and to particularly get in touch if they thought their answers were overlooked or misinterpreted.

3.2.e. Data analysis

The analysis is conducted entirely from the viewpoint of the encyclopaedia authors. In this approach, an understanding of encyclopaedia development is constructed from the multiple perspectives held by different authors, “with each of these perspectives having equal validity, or truth” (Leedy and Ormrod 2001, p.147).

In order to get a fresh insight into the process of encyclopaedia development, I insisted on sticking as closely as possible to the data and adopted an inductive approach to the analysis. There are many inductive methodologies in the field of social sciences. Among the most known ones are thematic analysis (Aronson 1994, Boyatzis 1998, Fereday and Muir-Cochrane 2006) and grounded theory (Glaser and Strauss 1967, Strauss and Corbin 1998, Dey 1999, Charmaz 2007). Variants of these methodologies abound, particularly regarding the way in which themes and codes are identified. Because this study of encyclopaedia development is only exploratory and descriptive, I did not need to entirely follow the complex methodology described by the researchers listed above. Instead, I simply adopted a two-stage process. The first stage is based on the iterative line-by-line coding of the data (Figure 8), followed by a grouping of the codes into flexible categories and subcategories. In this second stage, I chose the categorisation I found to best fit my data, namely by grouping the codes according to the steps adopted by encyclopaedia authors for the communication of SU&C. The findings of this study are summarised in Chapter 8, Section 2, starting on p.187.

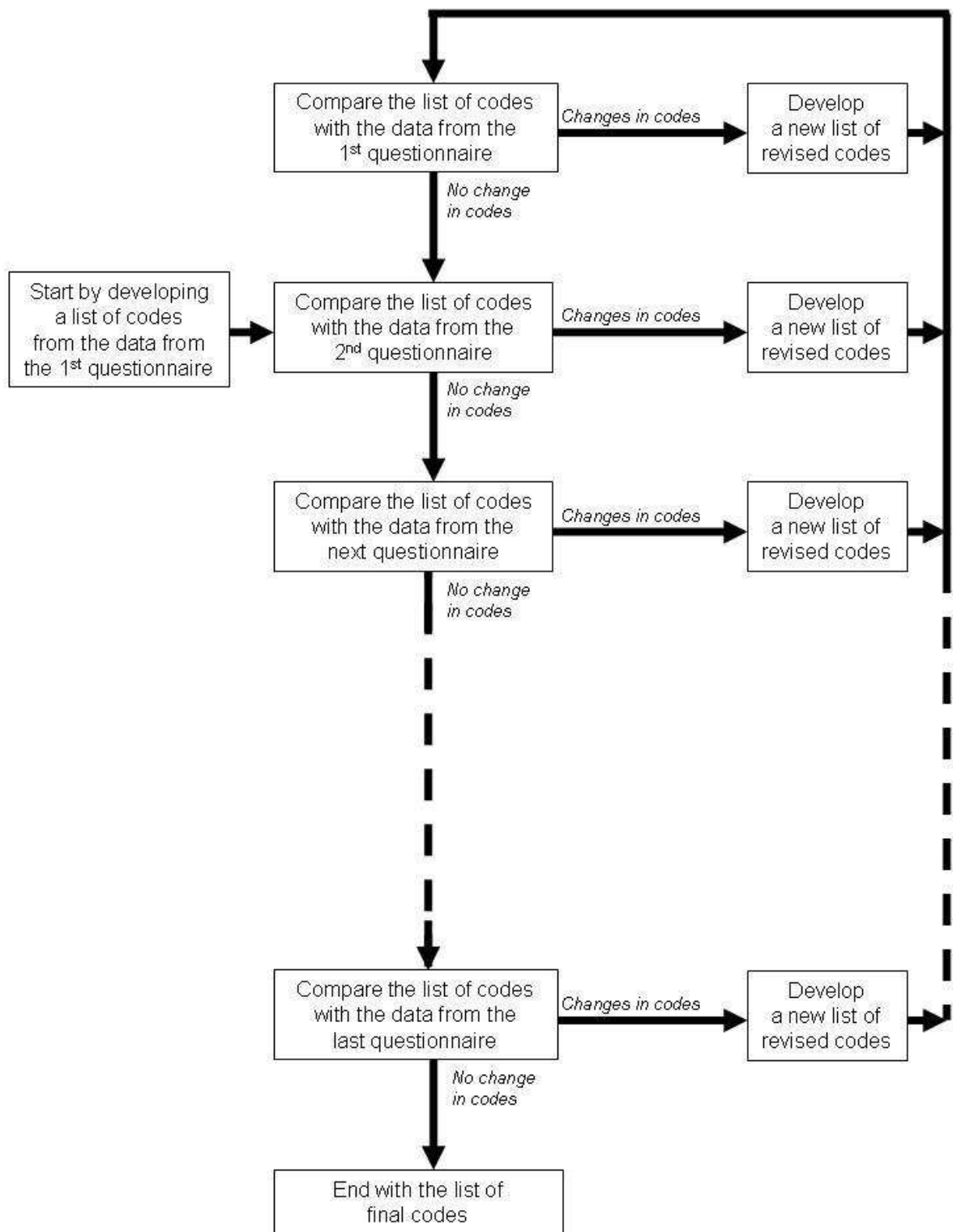


Figure 8. Coding process for the data from the survey questionnaires

3.2.f. Limits of the methodology

One limitation of the current study lies on the fact the coding of the data was conducted without being checked by a second coder. As in any qualitative

analysis, subjectivity and misinterpretation of the data from my part were a possibility. The fact that the participating authors were given the chance to comment on the preliminary report diminished that risk.

Unfortunately, the second phase of the study –which was supposed to be the follow-up interview with selected participants– did not occur. The decision was based on some comments made in the questionnaire whereby some authors complained that it was difficult to accurately reflect on their experience given the delay between the time when the article was written, when the article was published, and finally, when the survey was conducted.

3.3. Study of encyclopaedia quality

The final study for the thesis is based on the understanding that the concept of quality and authority are interwoven. Chapter 2 in particular offers a theoretical overview of quality assessment. The final study then investigated how these theories are applied in practice. The quality assessment conducted by book reviewers is considered here, not only because of the accessibility of book reviews which makes the study possible, but also because of the importance of book reviews in influencing other people's choice of which publication to consider as cognitive authority.

3.3.a. Research questions

Three research questions were considered for this study:

- Which parameters are used by book reviewers when they assess the quality of encyclopaedias?
- To which extent do encyclopaedias fulfil standards of quality for the various parameters?
- Which, if any, of the various parameters considered for quality assessment could determine whether the encyclopaedia would be recommended to potential readers?

3.3.b. Selection of the unit of analysis

Because of my educational background, encyclopaedias on science and technology were also considered in this study; more specifically, those which were reviewed in scientific journals. In order to access a large number of book reviews, I decided to search the Elsevier's ScienceDirect database which –with more than 9.5 million journal articles and book chapters– claimed to cover over 25 percent of the world's science, technology and medicine full-text and bibliographic book and journal information¹⁹.

3.3.c. Data collection

A systematic sampling using the online search within ScienceDirect was conducted (Leedy and Ormrod 2001, pp.216,218, Fink 2005, p.86). More specifically, publications with the words “encyclopaedia” or “encyclopedia” in the title were selected, as long as they were published between the years 2000 and 2010 and were actually book reviews (Figure 9). The publications from the “review article” category were also checked for potential book reviews. The full-text of the appropriate reviews were subsequently downloaded for analysis.

3.3.d. Data analysis

This is a qualitative content analysis. Content analysis is traditionally defined as “a research technique for the objective, systematic and quantitative description of the manifest content of communication” (Berelson 1952, p.18). In my case, as in many modern content analyses (Krippendorff 2004, pp.18-21), the focus is more on the contained or latent content of communication. Although I did not base the analysis on counting occurrence of words, I still counted the occurrence of codes, themes or ideas (Kracauer 1952/1953, pp.637-638). Because I coded the book reviews following the parameters of quality assessment defined from the theoretical discussion of quality in Chapter 2, my approach fell within what is a “directed qualitative content analysis” (Hsieh and Shannon 2005, pp.1281-1283) or “deductive content analysis” (Mayring 2000). I also provided a descriptive account of the findings regarding each of the 22 parameters used in

¹⁹ See www.sciencedirect.com (accessed in July 2010)

encyclopaedia quality assessment. The findings of this content analysis are summarised in Chapter 9.

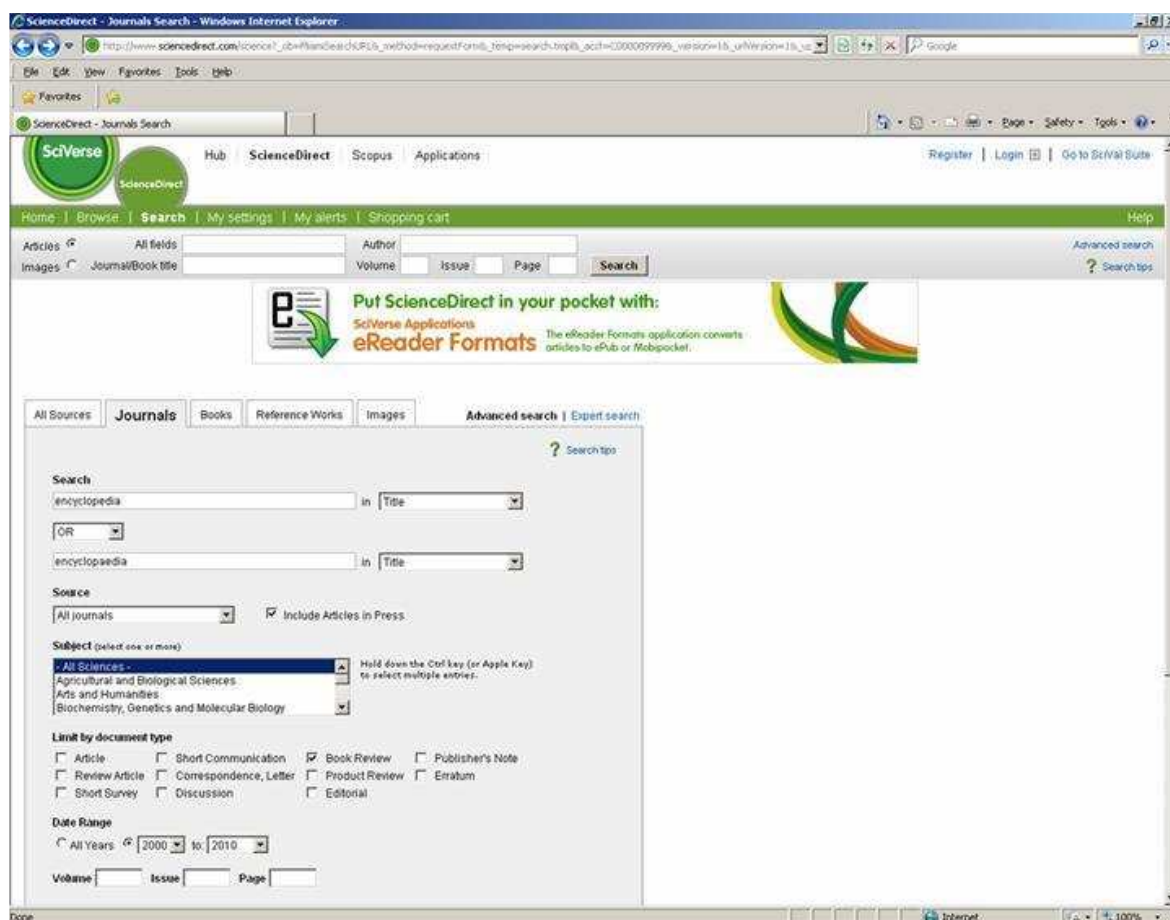


Figure 9. Screenshot of the search page of ScienceDirect

3.3.e. Limits of the methodology

As was the case for the study of encyclopaedia development, this study suffers from the lack of a second coder who could have guaranteed the reliability of the findings (Mayring 2000). To, at least, offer the reader the option of checking both the validity of the approach and the reliability of the findings, the full list of reviews considered in the study was provided (See Appendix 4), and many quotes from the reviews are also provided as evidence in the report.

4. Ethical considerations

As part of the measures to ensure that no ethical infringement was violated, I submitted the research to the scrutiny of the ethical committee within the University of Glasgow; a practice which is now widespread in many educational

and research institutions (Cohen *et al.* 2000, Hopf 2004). Special care was taken to protect the people (and institutions) participating in the research, including in the areas recommended by Leedy and Omrod (2001, pp.107-111); namely, the protection from harm, the informed consent, the right to privacy, and honesty with professional colleagues. Considering the nature of the research, there was little risk of physical or psychological harm to the individuals. Yet, I took additional precautions in ensuring that no damage is done to the professional reputation of individuals or institutions. I particularly had to be careful in my choice of words when I was discussing specific publishers throughout the thesis. During the study of encyclopaedia development, a brief but succinct and clear statement of the research was included in the body of the email sent to the encyclopaedia authors invited for the survey (See Appendix 1). The participants were offered the guarantee that their participation would be kept confidential so the data provided was subsequently anonymised. In particular, the encyclopaedia authors were only identified using the name of the encyclopaedia they contributed to, followed by a number assigned at random. Moreover, any information which could be used to identify them was also removed the preliminary report and from the current thesis: any mention of the institution where they work, the title of the article they contributed to, and any detailed discussion on the topic of their article which could allow other people to recognise them as “the expert” or “the well-known figure with this particular standpoint” in the area.

Regarding this last point, I actually encountered the opposite situation whereby participants strongly wanted their opinions to be heard and specifically asked to be identified by name. It is true that there is a concept of reciprocity in research, whereby the researcher may give people something back in return for their participations whenever appropriate (Marshall and Rossman 1995, p.71). I thought that presenting the views from these authors would be enough (after all, these views are part of the perspective that I was trying to capture through the study). I, however, decided not to disclose any name. Even though I had offered participants the option of being acknowledged by name, I believe that, as principal investigator of the research, I could decide on what was appropriate or not appropriate and act accordingly without thinking of my being dishonest. In

this case, I did not want this thesis to appear as another person's advocacy material.

5. Approach to the writing

With so many different studies embedded within the case study, there were a few requirements that I had to consider while writing the chapters on findings, discussion and conclusion. For this, particular decisions were made regarding the general organisation of the thesis, the presentation of the information, and the tone/style used in each chapter.

As Leedy and Omrod (2001, p.226) indicate, it would be very easy to get drowned in the amount of data. To help the reader, I decided to present the findings from each study in separate chapters which could be read independently from one another. At the same time, I had to make sure to show the reader how each study was tied to the main case and contributed to the thesis research question (Yin 2003a, p.45). At the end of each finding chapter, I systematically added a section labelled "Towards an understanding of encyclopaedia authority in general".

I also wanted the reader to not only easily understand the information presented, but also to be able to check the evidence supporting the arguments presented as needed. The quantitative evidence was kept within the main text, summarised in the form of table or figures, instead of being relegated to the Appendices. Similarly, the qualitative evidence was represented in the form of quotations interspersed throughout the text. Yet, large sections of text regarding the encyclopaedia authors' expectations, as well as their criticisms of the encyclopaedias under review, as well as texts summarising the editing policies within the encyclopaedias on global warming and climate change were moved to the Appendices. Although these texts would be useful in the definition of practical guidelines for future encyclopaedia development, they were of secondary relevance for the discussion of encyclopaedia authority.

In general, I tried to present the thesis findings in a neutral, objective way, so that it was the data which was speaking to the readers. I tried to apply standards in scientific writing and refrained as much as possible from discussing

the data within the findings chapters. By contrast, a more personalised style was adopted in the Discussion Chapter in order to highlight the fact that it was my voice and my personal analysis of the findings which was presented.

In fact, I want to end this Methodology Chapter with two additional notes on the writing of the discussion chapter.

- Firstly, I knew from personal experience that the synthesis of findings of research publications can sometimes be tedious to read, so I wanted to write the discussion chapter in a way that would –hopefully– help the reader engage with the text. There are different ways of presenting a case study report, different story-telling techniques (Marshall and Rossman 1995, pp.117-118, Stake 1995, pp.127-128). In my case, I returned to the metaphor of the kaleidoscope mentioned in the Introduction Chapter of the thesis and took that metaphor to structure the entire Conclusion Chapter.
- Finally, because this thesis is an exploratory study in an area which benefits from very limited attention from the scientific community, the Conclusion Chapter has little reference to previous research and focuses more on my suggestions for future investigations.

CHAPTER 4.

HISTORICAL BACKGROUND ON ENCYCLOPAEDIAS

Before Chapter 5 takes the thesis to the particular case of *Wikipedia* –which is the most popular encyclopaedia of the 21st century– the current chapter offers an introduction to the word of encyclopaedias and tells their history throughout the centuries. The chapter starts with an investigation the origin of the term ‘encyclopaedia’, followed by a brief recounting of the early encyclopaedic compilations and a definition of modern encyclopaedias. The chapter then introduces some of the major encyclopaedias which marked the history of encyclopaedia making over the centuries. The major part of the chapter describes the evolution of the genre (the format, the nature of content, the arrangement of the content), the continuous improvements in the development process (content development and control, as well as content update). The chapter also identifies the multiple roles played by encyclopaedias in society. The chapter highlights how the early encyclopaedias from various parts of the world differed from one another until they finally converged towards a standard model of modern encyclopaedias. Then, to go back to the topic of encyclopaedia authority, the chapter offers a series of potential explanations how the various changes throughout the centuries may have contributed towards building the encyclopaedias’ reputation as “the ultimate authorities”.

1. Introduction to encyclopaedias

1.1. Origin of the term

The word ‘encyclopaedia’ comes from the combination of two Greek nouns: ‘*enkyklios*’ which means circular, periodic, ordinary, or general, and ‘*paideia*’ which means learning, education, or child rearing (e.g. The Concise Oxford

Dictionary of English Etymology 1996, The American Heritage Dictionary 2006, The Merriam-Webster Online Dictionary 2010a). Hence, an encyclopaedia is a “circle of learning” (The Oxford Dictionary of Word Origins 2009), a “training in circle” (Online Etymology Dictionary 2010b), a “general course of instruction” (The Concise Oxford Dictionary of English Etymology 1996), as well as an “all rounded” or “general education” (Encyclopaedia Britannica Online Collison and Preece 2010).

A variation of the definition of encyclopaedia was provided by Aristotle when he used ‘*enkyklios*’ not as a noun –as explained in the previous paragraph– but as an adjective which translates as “ordinary” or “what is in circulation” (West 2002). Another translation of the adjective ‘*enkyklios*’ is “what is current and normally necessary” which is further explained by Stecchini (1962) as the knowledge one needs to acquire before proceeding to higher education. More generally, the word ‘encyclopaedia’ as used in Ancient Greece designates both the collection of existing books –like the collection gathered during the foundation of the Alexandrian library at the beginning of the third century before our era– and the “book that unites the knowledge found in all other books” (Jacob *et al.* 1997). When designed to unite the knowledge from other books, the early encyclopaedias were generally organised in the same way as the Greek educational curriculum, providing the local elites with “do-it-yourself courses” –which is another suggested definition of the word encyclopaedia (Burke 1996).

1.2. Early encyclopaedic compilations

Although the term ‘encyclopaedia’ has Greek roots, earlier encyclopaedic compilations were conducted in various parts of the world and were almost as old as the discovery of writing. These compilations emerged from society’s natural aspiration to continuously accumulate words, beliefs, rituals, and artefacts in an attempt to capture and consolidate knowledge; an aspiration widespread in all civilisations, including those from ancient Africa, Oceania, and Pre-Columbian America (Godin 1996).

Without the systematic codification of knowledge in the written form, however, one cannot really talk of “encyclopaedia” (Katz 1992). In fact, the primary step

in any encyclopaedic endeavour consists of thoroughly writing down the existing knowledge. The first people to engage in such activity were probably the Sumerians during the kingdom of Assurbanipal in approximately 668-627 BCE (Chiera 1956, Schmandt-Besserat 1986) as demonstrated in their clay tablets containing astronomical observations (Sachs 1974), medical prescriptions (Borchardt 2002) or dictionaries of synonymous terms (BNF 1996a). It is only once knowledge becomes available in written form that the subsequent steps in encyclopaedic compilation can occur. Namely, the written texts are gathered in the same place and organised following a certain system –or they are sometimes even abridged– in order to facilitate the access to the knowledge by the people who need it (Collison 1964).

It should be noted, however, that not all societies were eagerly engaged in the systematic written compilation of knowledge. The case of the early Japanese societies can be cited as an example, since, according to Godin (1996), they had very few encyclopaedias. The first Japanese encyclopaedic compilations probably appeared only in the Edo Era in the 17th century (Collison and Preece 2010).

1.3. Standards in modern encyclopaedias

Even if there is no real consensus on what constitute modern encyclopaedias (Melamed 1985), encyclopaedias have long ceased to refer to any particular educational curriculum. Sometimes, modern encyclopaedias follow Pliny the Elders' model and aim to be presenting and organising 'the knowledge deemed essential or universally worth knowing' (Kister 1986, p.1). Other times, modern encyclopaedias follow the Renaissance model and strive towards the compilation of 'vast amounts of knowledge about the known world' (Featherstone and Venn 2006, p.6). In both cases, as the amount of information printed and online increases at exponential rate (e.g. Kister 1986, Lesk 2005, Gantz *et al.* 2008), providing a work which encompasses the existing knowledge and which remains abreast of the advances in the fields is quasi-impossible. Unsurprisingly, modern encyclopaedias are necessarily an 'abridged version' (Yeo 2001) or 'an abstract of human knowledge' (Thoreau 2004, p.176 quoted in Bell 2007), with the hope that, as in Rabelais' model, our encyclopaedias offer a real digest of knowledge. Paradoxically, in contemporary dictionaries, the various definitions of the word

“encyclopaedia” –also spelled “encyclopedia”– have little mention of any potential boundary in the content coverage. For instance, encyclopaedia is defined as:

a work that treats comprehensively all the various branches of knowledge and that is usually composed of individual articles arranged alphabetically (Merriam-Webster Dictionary 1986);

a literary work containing extensive information on all branches of knowledge, usually arranged alphabetically” or “an elaborate and exhaustive repertory of information on all the branches of knowledge (Oxford English Dictionary 1989);

or

a book, often in many volumes, containing articles on various topics, often arranged in alphabetical order, dealing whether with the whole range of human knowledge or with one particular subject (Collins English Dictionary 1994).

From the evolution of various aspects of encyclopaedia making, universal standards have been gradually established (Collison 1964, Kister 1981). The content of modern encyclopaedias is expected to be objective and to give prominence to scientific knowledge whenever possible. In fact, the difference between the modern and pre-modern encyclopaedias is clearly summarised in the following quote:

the modern encyclopedia seeks to provide knowledge/information that is scientifically proven, whereas the pre-modern one aims at educating the reader according to a doctrine. While the modern encyclopedia leaves the reader to form his or her own opinion on the given subject (a “neutral” approach), the pre-modern one prescribes to the readers what they should believe and what should be considered as being good and valuable (Dov Patel, cited in Featherstone and Venn 2006, p.270).

The text is often –but not necessarily– accompanied by illustrations such as pictures, drawings, and maps. The text also often has cross references. Additionally, an analytical index of people, places and minor subjects is generally provided. A list of references or list of suggested readings can sometimes accompany each encyclopaedic entry or can be compiled at the end of the volume.

Modern encyclopaedias are generally developed by numerous subject experts as authors and/or as members of the editorial team. Whether it is a generic or a specialised encyclopaedia, the entries are typically arranged in an alphabetical

order, a thematic order, or a combination of the two. There are various ways of ensuring that encyclopaedias are up-to-date: regular re-edition, continuous update, supplements and '*Book of the Year*' editions.

A clear point of contention regards the role that encyclopaedias should be playing in contemporary societies. The debate is vividly captured in a special issue of *The American Behavioural Scientist* published in 1962 where several editors of major encyclopaedias wrote a series of articles on the potential development of what was called the "one-world encyclopaedia". For example, Barzun (1962) insists on the idea that the encyclopaedia should be first and foremost a work of reference. Sills (1962) agrees with Barzun, but he also adds that, as a reference material, the encyclopaedia should have an interdisciplinary approach to knowledge. In contrast, Couch (1962) and Van Doren (1962) argue that teaching should be the priority whereas Stover (1962) suggests that the encyclopaedia should be a way of preserving societal cultures as well as spreading certain philosophical views of the world. More recently, Featherstone and Venn (2006) follow up on Stover's suggestion and reject the general tendencies of past encyclopaedias to impose a global version of knowledge – typically of Western origin. Featherstone and Venn advocate that encyclopaedias should give more room for the preservation of local knowledge.

Notwithstanding the debate on the role of encyclopaedias, the encyclopaedia standards mentioned above are generally widely adopted.

2. Encyclopaedia inventory since the 5th century BCE

Encyclopaedias have a very long history which is thoroughly described in Robert Collison's book *Encyclopaedias: Their History Throughout the Ages* which was published in 1964. An updated but shorter account of this history is also provided in the entry on "Encyclopaedia" that Collison wrote with Preece for Encyclopaedia Britannica (2010). In his book, Collison lists over 630 manuscripts and printed books –not including reprints and new editions (see Figure 10). The following sections tell that history as it occurred in the European continent in general; then in England and Scotland in particular; and finally in the rest of the world.

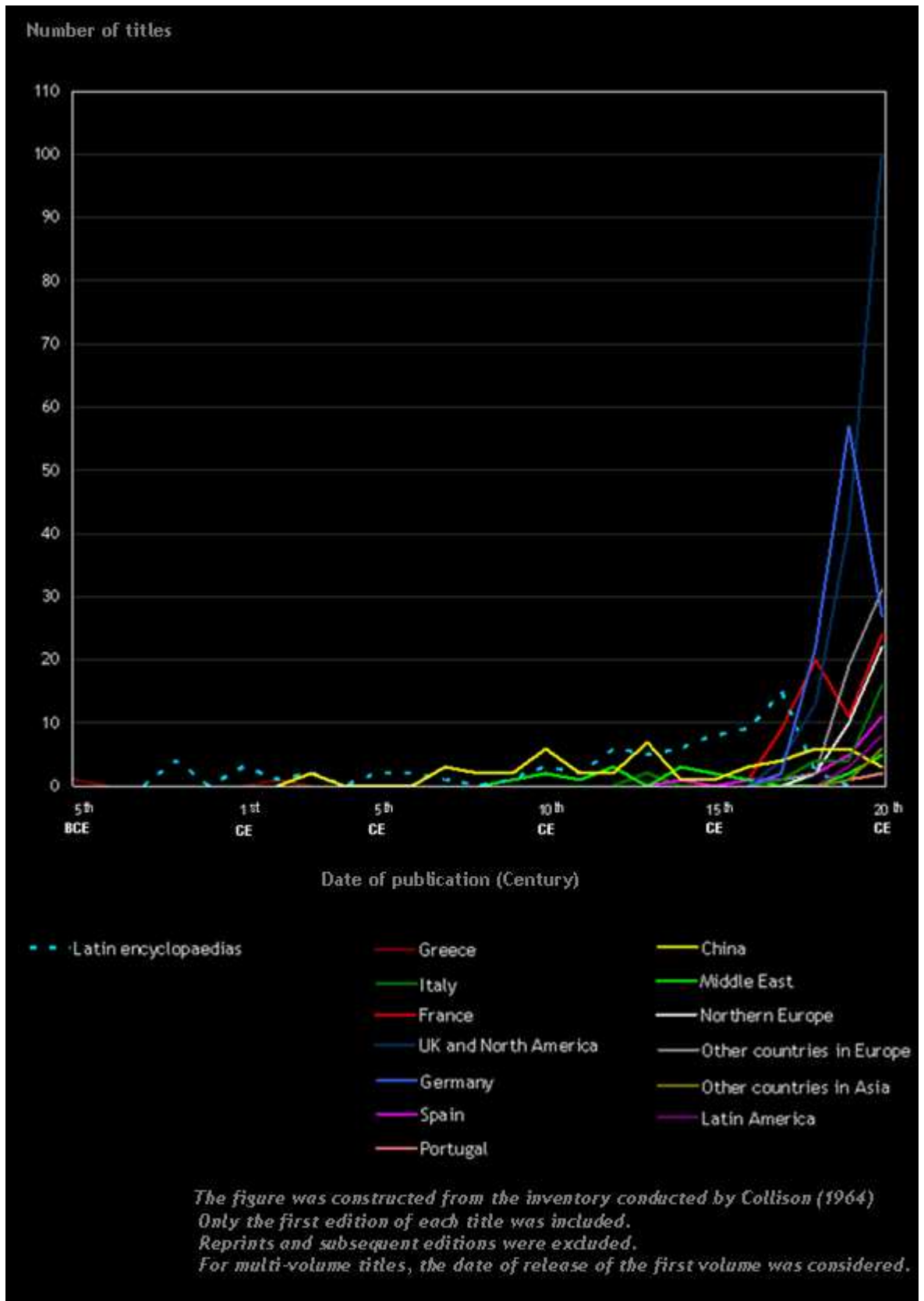


Figure 10. Encyclopaedias developed in various parts of the world

2.1. Encyclopaedias in Europe

According to Collison, the history of the encyclopaedia starts in the Antique Greece with the works of Plato and Aristotle in the 5th century BCE. Then, Latin encyclopaedias took over during the Roman and Byzantine Empire. Throughout the Middle Ages until the 18th century, European encyclopaedists continued to write in Latin (the common language used at the time to spread knowledge); for example the German monk Theophilus in the 12th century or the French Charles Etienne in the 16th century. The first break away from Latin occurred in the 13th century when encyclopaedists started to write in the French language –for instance when Gautier de Metz wrote *L’Ymage du Monde* to describe existing knowledge of the world to the laymen (see also Villemin 2005) or when the Brunetto Lantini wrote *Li Livres dou Tresor* in an attempt to reach the French-speaking elites of Venice. Some encyclopaedias written in Italian appeared in the 18th century, roughly around the same time as encyclopaedias written in English and German first emerged. From the 19th century onward, encyclopaedists from the rest of Europe also became engaged in making encyclopaedias for their fellow citizens. The encyclopaedists from Spain, Hungary, Russia, Denmark and The Netherlands were particularly productive.

2.2. Encyclopaedias in England and Scotland

Collison indicates that encyclopaedists from England and Scotland were involved in encyclopaedia making since the Middle Ages; although, at the time, their works were still written in Latin. Among the most famous encyclopaedists were Gervase of Tilbury and the English Augustin monk Honorius Inclusus (both from the 12th century), and Bartholomaeus Anglicus (from the 13th century) who compiled the *Imago Mundi*, the *Liber de Mirabilibus Mundi* and the *De Proprietatibus Rerum* respectively. The first encyclopaedia composed primarily in English is probably John Harris’ *Lexicon Technicum; or, An Universal English Dictionary of the Arts and Science* which was published in 1704 (see also Russell 1997). This latter work inspired Ephraim Chambers to produce the famous *Cyclopaedia: or, An Universal Dictionary of Arts and Sciences* which was published in 1728 (see also Yeo 1996). Then, Andrew Bells, Collin Macfarquhar, and William Smellie started the saga of the *Encyclopaedia Britannica* –also

known simply as *Britannica*. The complete first edition was published between 1768 and 1769 but new editions continue to be released at regular interval, even today (see also Kogan 1958, Wallenchinsky and Wallace 1975-1981, Glasgow 2002).

Modern encyclopaedias particularly benefited from the legacy left by three cases:

- The works of Francis Bacon;
- Ephraim Chambers' *Cyclopaedia*; and
- *Encyclopaedia Britannica*.

Although Francis Bacon (1561-1626) never compiled any encyclopaedia; his writings strongly advocate for greater cares in the making of equally comprehensive and well-planned encyclopaedias. Bacon insists on the need for a greater coverage of the more practical knowledge and he wanted to transform the encyclopaedia into what he called a “good digest of commonplaces” (see also Langridge 1991, Yeo 1996, Longo 2000). Additionally, Bacon emphasises the need to make clearer links between the various disciplines. Collison (1964, p.82) writes about Bacon:

He was revolutionary in that he eschewed the age-old controversies and academic disputes in favour of practical matters on a universal scale. The outline of the encyclopaedias so far demonstrates how curious and limited were the conception and ordering of human knowledge held by theologians, philosophers and scholars... and how poor till now had been their attempts to show the relationship between individual subjects to each other.

Regarding Chamber's *Cyclopaedia*, Collison says that it is often considered as the father of modern encyclopaedias (see also Doyle 1970, Yeo 2003). Several reasons are provided for such a claim. First, unlike previous encyclopaedias which consist mostly of the compilation of existing texts from old books, the text from *Cyclopaedia* was specifically written by its author –a practice which has become commonplace today. Then, *Cyclopaedia* offers an example of very coherent and well-organised content. Finally, *Cyclopaedia* is easily accessible due to its alphabetic ordering and its elaborated system of cross-referencing.

Finally, regarding *Encyclopaedia Britannica*, it is often considered the *crème-de-la-crème* of the English language encyclopaedia (Kister 1981, Katz 1992). Not

only is *Britannica* the encyclopaedia with the longest tradition, but each of its past editions brought innovative developments in the encyclopaedia industry (See Table 2 on p.97). In particular, *Britannica* introduced the system of continuous revision in 1929 and published “Book of the year” as a way to facilitate the up-date of voluminous generic encyclopaedia (Kogan 1958, Glasgow 2002); both systems are now widely adopted by many of the leading encyclopaedia publishers around the world. It was also through the publication of the various editions of *Britannica* that the encyclopaedia tradition became strong in the USA (Collison 1964). Even in the late 20th century and in the 21st century, *Britannica* continues to be a leader in encyclopaedia making. For example, *Britannica* showed the way for the diversification of encyclopaedia delivery by being among the first to put their content on CDs, then on the Internet (Auchter 1999, Clark 2001). More recently, *Britannica* has announced its intention to include the model of collaborative writing online under Web 2.0 – similar to the model used in *Wikipedia*²⁰– within its development process (Catone 2009, Hutcheon 2009); although this latter development has yet to happen.

There are other famous English language encyclopaedias; for instance *The London Encyclopaedia* (published in 1829), the *Encyclopaedia Metropolitana* (published between 1817 and 1845), or the *Cassell's Concise Encyclopaedia* (published in 1883). Many of the encyclopaedias developed in other countries were also translated into English, including *The Great Historical, Geographical, Genealogical, and Poetical Dictionary* (published between 1701 and 1705) which was translated and compiled from existing encyclopaedias from various countries.

Collison indicates a rise in the development of medium size and specialised encyclopaedias since the 19th century when publishers at that time realised that there was a real market for encyclopaedia publishing. Some publishers attempted to reproduce the *Britannica's* model, as in the case of the *Edinburgh Encyclopaedia* in 18 volumes (first published between 1808 and 1830). But many other publishers were caught in a dilemma: they needed to sell encyclopaedias neither too large –as they would be too expensive and too long to produce– nor

²⁰ See Chapter 5, Section 1 on p.120

too small –as they would fail to cover important subjects, hence would not impress the buyers. As a result some publishers started to develop medium size encyclopaedias such as the *Encyclopaedia Edinensis* in six volumes (published in 1827). Others developed encyclopaedias on specialised topics only. Today, both practices are still widely observed in modern encyclopaedias.

2.3. Encyclopaedias outside Europe

Collison dedicates some attention to encyclopaedias from North America, particularly since the 19th century. In fact, the trends in encyclopaedia making described in England and Scotland for that period were also observed in the USA. For example, the *Encyclopaedia Americana* (published between 1829 and 1833) was based on the German *Conversations Lexicon*. Among the famous American examples is the *World Book Encyclopaedia* (first published between 1917 and 1918).

Collison's inventory also covers encyclopaedias from outside the European continent, particularly China and the Arab world. According to Collison, Chinese encyclopaedia making started in the 3rd century CE with the *Huanglan* whereas the Arab encyclopaedia making started much later with the *Kitāb 'Uyūn al-Akhhbār* by the 9th century polymath Ibn-Quitaiba as the foremost example. Both the Chinese and Arab encyclopaedia seem to be uninterrupted since these times.

In the remaining parts of the world, Collison's book only lists 22 encyclopaedias published for the period between the beginning and the middle of the 20th century. More specifically, there are 14 titles from Australia and other Asian countries –including Israel and Iran, as well as Burma, India, Indonesia, Thailand and Sri-Lanka– as well as eight titles from Latin America –from Brazil, Mexico, Venezuela, El Salvador, the Yucatan and the West Indies.

Table 2. Evolution of *Encyclopaedia Britannica* from the 1st to the 15th edition

Edition	Publication	Changes
1 st	1768-1769/71	This was published by Andrew Bells, Collin Macfarquhar and William Smellie in Edinburgh. There were lengthy articles on major subjects (particularly strong in science) interspersed with brief entries on minor subjects
2 nd	1777-1784	The number of articles was tripled. There were new historical and bibliographical entries, and added maps in the entry on geography.
3 rd	1788-1797	There were improvements in the history of individual countries.
4 th	1800-1810	To secure sales, there were negotiations with the Edinburgh bookseller Archibald Constable who then introduced encyclopaedia sale by subscription.
5 th	1816-1824	Contributors started to be acknowledged at the end of major articles and at the beginning of each volume.
6 th	1820-1823	This was mostly a reprint of the previous edition.
7 th	1827-1842	This edition was issued under the imprint of Adam Black, following the death of Archibald Constable. The volume was reset and stereotyped. Each volume had larger pages and had more pages.
8 th	1853-1860/61	This edition introduced a supplementary volume devoted entirely to the index to the whole work and published in 1961.
9 th	1875-1888	A definite attempt was made to relate the content with everyday life and practical articles were inserted. The volume index added in 1889 was a complete guide to the content. All of the major articles had individual indexes and substantial bibliographies.
10 th	1902	This was simply the 9 th edition with a supplement of 11 volumes. The ownership moved from Edinburgh to the USA where American businessmen used direct marketing and door-to-door sales.
11 th	1910-1911	Articles from the 9 th edition were fully reorganised. This was the first full edition of Britannica to be issued completely at one time. This process allowed the editors to present a more coherent, more comprehensive, and better organised encyclopaedia.
12 th	1922	This was the 11 th edition with three supplement volumes with growing emphasis on British and American content. Part of the content started to be developed from the USA.
13 th	1926	This was the 12 th edition with three supplement volumes
14 th	1929	This edition had editors both in the UK and in the USA and American contributions reached half of the total content. The system of continuous revision and annual publication was adopted whereas the <i>Britannica Book of the Year</i> was introduced to cover major events of each year.
15 th	1974	In 1964, encyclopaedia reorganised its approach to the provision of a circle of learning, so instead of pushing alphabetical ordering to the extreme and breaking down information, Britannica grouped similar articles on similar topics near one another. For this, editorial planning committee were hired

The table summarises the chapter on *Encyclopaedia Britannica* (Collison 1964, pp.138-155).

- Since 1974, *Encyclopaedia Britannica* adopted a continuous revision policy.
- Since 1985, *Encyclopaedia Britannica* started to be structured in four parts:
 - 1) *Micropaedia* or the Ready reference, then
 - 2) *Macropaedia* or Knowledge in depth,
 - 3) *Propaedia* or Outline to knowledge, and
 - 4) *The Indexes*.
- The current edition is titled *The New Encyclopaedia Britannica* and is available in print, on DVD and online.

It is possible that Collison underestimates the size and importance of encyclopaedia making outside Europe. For example, regarding the encyclopaedias in the Arab world, Collison barely mentions the Egyptian works (Blachère 1970, van Berkel 1996) and totally overlooks the Yiddish and Hebrew ones (Melamed 1985, Marzolph 1996, Harvey 2000, Fontaine and Berger 2006, Prodöhl 2010). Collison's inventory also fails to illustrate the outburst of activity in Arabic encyclopaedias around the 13th century reported by other scholars (Harvey 2000b). In the Indian sub-continent, Collison makes no mention of any local encyclopaedia activity. By contrast, Godin (1996) affirms that there was definitely some encyclopaedic tradition in that part of the world during the period of Antiquity.

3. Encyclopaedia evolution since the 5th century BCE

3.1. Evolution of the genre

Not only does the history of the encyclopaedia start many centuries ago, but the concept of the encyclopaedia itself has gone through complex evolution before finally reaching the modern forms.²¹ The following sections compare the form and content of the early encyclopaedic compilations, from various parts of the world, before exploring how the scope of the encyclopaedia content has changed over time.

3.1.a. Format and type of content

Encyclopaedias were not always books. Indeed, the early encyclopaedic texts from various parts of the world had different forms. For example, in the case of the Antique Indian subcontinent, Godin (1996) argues that the oldest Sanskrit texts (such as the *Vedas*, a title which can be translated as 'Knowledge'; the epic texts *Mahabharata* and *Ramayana*; and the *Purana* mythologies) form the first Indian encyclopaedic compilations. Although many of these texts read like poetry, their content covers many of the sciences of that time: philosophy and rituals, as well as medicine, archery, architecture, and military science. In fact,

²¹ See Chapter 4, Section 5 on p. Error! Bookmark not defined. for more information on modern encyclopaedias

like Godin, other scholars (e.g. Witzel 2005, Monier-Williams 2008) argue that most ancient Indian texts provide a holistic description of the world.

By contrast, the first encyclopaedic efforts in Imperial China consist of voluminous collections of existing official documents (Stecchini 1962, Burke 1996, Beyer de Ryke 2003). Godin (1996) describes the early Chinese encyclopaedias as extremely descriptive texts with extensive use of long quotations and Daniels (1998) suggests that these encyclopaedias tend to be highly comprehensive because of the local Confucianism concerns with the study of all ancient texts. Among the most famous titles are the *Yongle Dadian Encyclopaedia*, which has more than ten thousand volumes, and the *T'u-Shu Chi Ch'Eng*, which is probably the longest printed book in the world with more than 750.000 pages (Burke 1996).

In the Arab world, there are many scientific writings from the Middle Ages which are considered encyclopaedic in nature. Of particular value are the works of Hebrew scholars such as Abraham Bin Ezra or Abraham Bar Hiyya (Zonta 1996, Lévy 1997, Fontaine and Berger 2006), as well as the works of Islamic scholars such as Ibn Qutayba, Al-Kindi, Avicenna, and Averroes (Pellat 1954, 1966, Falagas *et al.* 2006, Iqbal 2009).

These examples are different from the early encyclopaedic texts from the Western parts of the world. Specifically, in Classical Greece, the early encyclopaedias consist of direct transcription of the teachings from the great philosophers of the time (Collison 1964, Lory 1988) –particularly from Plato and Aristotle. Meanwhile, in Ancient Rome, the early encyclopaedic texts are in the form of letters –such as Cato's letters to his son which are compiled in the *Praecepta ad Filium* (written about 183 BCE). Similar examples from Ancient Rome are the writings of Varro (116 - 27 BCE) and the writings of Celsus (25 BCE - 50 CE).

Despite their early differences in format and content, the encyclopaedia tradition from the various parts of the world went through a comparable development whereby the encyclopaedists moved from just compiling excerpts from existing writings to composing new texts summarising the existing

knowledge. In the European tradition in particular²², Chamber's *Cyclopedia* is the first exemplar with such an approach to encyclopaedia writing (Yeo 2003). In fact, Creech (1982) indicates that the practice of writing original encyclopaedic text becomes universal from the 18th century.

3.1.b. Nature of knowledge

The type of knowledge considered “of encyclopaedic value” and the breadth of the coverage –in particular the importance allocated to science topics– evolved differently from one encyclopaedic tradition to another. The following paragraphs describe these changes, although the cases of the encyclopaedias from India, China, and Arab countries are less detailed than those from Classical Greece, Ancient Rome and other European countries.

A cursory survey of the publications on the subject reveals some general assumptions about the content of the Indian encyclopaedias. As mentioned earlier, Godin (1996) indicates that a widespread practice in ancient Indian literature is to provide a holistic overview to knowledge. In the same paper, Godin also reports that the various philosophical schools and religious movements prevalent in the ancient history of the Indian subcontinent gradually developed their own encyclopaedias. From these two assertions, it may be reasonable to presume that the content of the Indian encyclopaedias has a very wide scope but gives prominent importance to philosophical reflections and divine knowledge. In contrast, Featherstone and Venn (2006) mention regions in India which have long established traditions in sciences such as mathematics and astronomy. It is therefore possible that some of the ancient Indian encyclopaedias were dedicated to these sciences. Unfortunately, the first inventory of Asian reference works ever conducted only lists eight generic encyclopaedias and a handful of specialised ones, most of which were published in the 20th century (Garde 1956), hence it is impossible to know with certitude what happened within the Indian encyclopaedia tradition between Antiquity and modern times.

²² See Chapter 4, Section 2.2 on p.93

Regarding the Chinese encyclopaedia tradition, several scholars (Collison 1964, Bibliothèque Nationale de France / BNF 1996b, Burke 1996) report that the early focus is predominantly on political and administrative topics which are useful for political elites and bureaucrats of the time. Then, as Collison indicates, there is a gradual increase in the coverage of more general subjects: for example, the *Ts'ê Fu Yüan Kuei* covers historical subjects; the *Shih Lei Fu* covers literature, whereas the *Shi Lei Fu* covers celestial and terrestrial phenomena, mineralogy, botany and natural history. Still, Godin (1996) reports that the Chinese encyclopaedias are generally poor in scientific facts as compared to, for example, the abundant description of institutions, customs and rituals. In fact, the inventory conducted by Collison shows it was only since the end of the 19th century that the number of medium sized generic and science encyclopaedias increased significantly.

Compared to the Indian and the Chinese encyclopaedias, the Arab ones probably have much wider scope. Religious beliefs in the Arab world, particularly Islam, encourages individuals to develop their knowledge and to sharpen their critical thinking (Heck 2002, Iqbal 2009). So, despite the fact that Arabic encyclopaedias allocate an important place to religion –Islam or Judaism– they also cover philosophy and literature, legal and administrative matters, practical knowledge, as well as a variety of sciences such as mathematics, cosmography, geography and natural sciences (Lory 1988, Zonta 1996, Endress and Filali-Ansary 2006, Fontaine and Berger 2006). The encyclopaedic coverage of science grew particularly in the Middle Ages, which was the Golden Age of science in the Arab world (Falagas *et al.* 2006). Many scholars (Lory 1988, Biesterfeldt 2000, Butterworth 2000, Melamed 2000, Netton 2002) report that Arab encyclopaedists were striving to include scientific knowledge from both Arab and non-Arab origin and some of them –for example Al-Kindi in the 9th century or the Brethren of Purity in the 10th century– even widely used encyclopaedias from other traditions as a basis for their works. During the Renaissance period, Lévy (1997) and Melamed (1985, 2000) report that the Hebrew encyclopaedists were even more eager to incorporate the new scientific knowledge from Europe into their encyclopaedias in order fulfil an ideal widespread at the time: the education of what they called “the perfect Israelite”. Prodöhl (2010) indicates that this trend was reversed in the 19th century when the Hebrew encyclopaedists started

setting aside “universal knowledge” to focus more on the coverage of national culture, knowledge and history.

Much more is known about the evolution of the encyclopaedia in Classical Greece, in the Roman and Byzantine Empires, and later in the Renaissance and Modern Europe. That evolution is discussed in the next few paragraphs, following a chronological order. Starting with the discussion in Antiquity, many scholars (Stecchini 1962, Collison 1964, Burke 1996, West 2002, Adler 2010) suggest that the early Greek and Latin encyclopaedias reflect local educational goals at the time. For example, when the Greeks started the encyclopaedia tradition in that part of the world, their effort focused on the transmission of the teaching of the Greek philosophers and emphasised topics such as philosophy and ethics in order to provide individuals with a “fully operational mind” and to train the next generations of “great thinkers” in the Greek *academia* and *lyceum*. Similarly, the early Latin encyclopaedias give prominence to rhetoric and laws because the ideal education in the Roman schools was to develop citizens with good oratorical skills.

A first attempt to include a wider range of subjects within the Latin encyclopaedias occurred during the first century of our era through the work of Pliny the Elder. Not only did Pliny expand the content of his *Historia Naturalis* beyond the topics of the Latin educational curriculum, but he also drew on the works of hundreds authors from various countries (Gudger 1924, Stecchini 1962, West 2002, Doody 2009). It is possible to say that Pliny’s approach to knowledge is an expansion of Aristotle’s (see Table 3). In fact, both Aristotle and Pliny are considered as key figures in the history of encyclopaedia making in general. The scope and organisation of their works set standards within and outside their countries of origin (Collison 1964, Melamed 1985, Lindberg 1992, Doody 2009). In particular, Roman encyclopaedists for many centuries plagiarised the *Historia Naturalis* or developed their encyclopaedias following Pliny’s organisation of knowledge whereas Aristotle’s organisation of knowledge was most widely adopted in the European and Arab encyclopaedias developed during the Middle Ages.

Table 3. Comparison between Aristotle's and Pliny the Elder's organisation of knowledge

	Aristotle's work	Pliny the Elder's work
Humanities	(Written by Aristotle) - Philosophy - Psychology - Ethics - Education - Politics and government - Rhetoric and Poetics	- Man - Anthropology - Ethnography
Arts	- Aesthetics	- Fine arts
Metaphysics	- Metaphysics	- Magic
Sciences	- Other branches of science	
Natural sciences	(Written by Aristotle's disciples) - History of science - Mathematics - Astronomy	- Astronomy - Cosmography - Meteorology - Mineralogy - Geography
Biological sciences / Medicine	- Medicine	- Zoology - Botany - Pharmacology - Medicine
Technology		- Metallurgy - Invention

Note: Table constructed from information provided in Collison (1964, pp.22-25)

Collison (1964) reports that, with the growth of Christianity throughout the Roman Empire, religious matters were given increasing importance in encyclopaedias, as a way to spread the Christian faith. As early as the fifth century of our era, Cassiodorus dedicated the great majority of his *Institutiones Divinarium et Humanarum Lectionum* to divine matters and included chapters on the Holy Scripture or on the Christian church. Similar trends are seen in many of the subsequent Latin encyclopaedias which were compiled by monks and religious figures such as St. Isidore who was the Archbishop of Seville in the 7th Century or Hrabanus who was the Abbot of Fulda in the late 8th and early 9th centuries. In Medieval Europe, the Latin encyclopaedias became reference materials for the use of both scholars and religious leaders (see also Cahn 1991, Beyer de Ryke 2003); consequently, their content was adjusted accordingly. In particular, these encyclopaedias mirror the curriculum used in the medieval

universities –a curriculum which is composed of the ‘*Trivium*’ (the essential grammar, logic, rhetoric) and the ‘*Quadrivium*’ (geometry, arithmetic, astronomy and music) and which is inspired from the ancient Greek curriculum. Clearly, there was a revival of the classic encyclopaedic tradition with some encyclopaedists even going back to Aristotle’s organisation of knowledge (see also Willoughby 1928, Stecchini 1962). Collison (1964) argues that it was in the Middle Ages that Christian beliefs permeated encyclopaedia content at most: not only a lot of space is dedicated to the religion but science is also often reinterpreted and codified according to Christian dogma. To fight this Christian dogmatism in encyclopaedias, there were sporadic efforts to promote scientific enquiry, for example in the 14th century *Compendium Philosophiae* by Hugh Ripelin or in the 17th century *Dictionnaire Historique et Critique* by Pierre Bayle.

The content of European encyclopaedias also drifted during the Renaissance period as a result of a mistaken translation of the word ‘encyclopaedia’ (Stecchini 1962, Clark 1992, Anonymous 2006, Anonymous 2008). More specifically, instead of being associated with the Greek noun ‘*enkyklios*’ or general knowledge, the term ‘encyclopaedia’ became associated with ‘*kyklos*’ which refers to the entire circle of human knowledge and, as a consequence, encyclopaedists tried to encompass the sum of the world’s knowledge into their work. It is also suggested (Stecchini 1962, De Pourcq 2008) that this new approach to the content of encyclopaedia deepened with the Renaissance scholars’ misinterpretation of the encyclopaedic education described by the French philosopher François Rabelais in *Gargantua*. This latter is a philosophical novel which tells the story of a giant who has an insatiable appetite for learning. The story is considered a metaphor for the ideal education in the 16th century; so, when Gargantua declares in the novel: “*Il m’a ouvert le vray puy et abism de l’encyclopedie*” –which West (2002, p.14) translates into “he has opened for me the true well and abyss of the encyclopaedia”– the Renaissance scholars assumed that Rabelais’ vision of the encyclopaedia was that of a limitless source of information, with a mixture of good and bad things, from which anyone could draw what pleases him or her. The confusion about the ideal content of the encyclopaedia was only elucidated when scholars realised that Gargantua’s education was not about the indiscriminate absorption of all information, rather

the in-depth assimilation of the knowledge from a carefully selected collection of works (Plattard 1910, Stecchini 1962, Godin 1998).

Eventually, European encyclopaedists started to dedicate their efforts towards increasing the importance of scientific knowledge inside encyclopaedias and organising knowledge in a way that would link the various sciences as advocated by Francis Bacon in the 17th century or August Comte in the 18th century to name but a few (Langridge 1991, Yeo 1991, Wernick 2006). Simultaneously, the coverage of religious content gradually decreased until it became limited to few articles inside generic encyclopaedias or concentrated to specialised encyclopaedias (Collison 1964). The 18th century *Encyclopédie, ou Dictionnaire Raisoné des Sciences, des Arts et des Métiers* by the French encyclopaedists Didérot and d'Alemberts offers an epitome of this rationalist approach to encyclopaedia making (Moureau 1990, Lepape 1991) –an approach which is adopted in many subsequent encyclopaedias developed within and outside the boundaries of France such as in Portugal (Reis 2007) or in the UK (Hughes 1951, 1952, 1953, 1955, McIntosh 1998).

Finally, the inventory conducted by Collison (1964) indicates that the majority of the early encyclopaedias were generic until specialised encyclopaedias suddenly began to thrive in the 19th century. In the 20th century, there were a number of titles dedicated to religion as well as subjects such as philosophy, mathematics, physics, chemistry, technology, social sciences whereas there were lesser titles dedicated to arts and entertainment such as music, sport or gardening. There was also the proliferation of encyclopaedias dedicated to the biography of philosophers and scientists as well as of national figures and personalities from various countries. In fact, Kister (1986) adds that the 20th century witnessed the growth of national encyclopaedias, not only in Europe but also in other countries from all around the world.

It is interesting to note that, unlike the organisation of modern encyclopaedias which has now reached some sort of universally recognised standards, the debate on the ideal content of encyclopaedias is not yet settled (Barzun 1962, Couch 1962, Sills 1962, Stover 1962, Layton 1965, Featherstone and Venn 2006). Since the 20th century, many encyclopaedists have expressed their views on the matter. Among the most active encyclopaedists were Paul Otlet with his *World*

Encyclopaedia (Rayward 2003, So 2004, van den Heuvel 2008), H.G. Wells with his *World Brain* (Wells 1937, Burrows 1996b, 1996a, Rayward 1999), as well as Otto Neurath and the Vienna Circle with the *International Encyclopedia of Unified Science* (Neurath 1937, 1946 and 1996, Reisch 1994).

3.1.c. Content arrangement

The need to organise the –typically voluminous– encyclopaedic content in a systematic and logical manner has always been a challenge. Encyclopaedists from all over the world adopted various strategies. The topical/thematic organisation of knowledge seems to be the most common approach in all time and in all places (at least as indicated by the work of Collison). Of course, there were some exceptions, for example some of the early Chinese encyclopaedias which were organised phonetically (Godin 1996) and some of the Hebrew encyclopaedias which were organised according to a chronological or a spatial logic, to cite the most peculiar ones (Melamed 2000). The rest of the discussion in this section mostly focuses on the evolution of content organisation in encyclopaedias from Europe.

Collison (1964) indicates that, in the Antiquity, the early Greek and Latin encyclopaedias usually followed a topical or thematic arrangement as suggested in Aristotle’s organisation of knowledge (see also Table 3 on p.**Error! Bookmark not defined.**). Then, in the first and second centuries of our era, Roman grammarians introduced the alphabetic arrangement in encyclopaedia making, which started to compete with the topical arrangement in subsequent Latin and European encyclopaedias. For many centuries, the encyclopaedists’ choice swung between these arrangements until the two approaches gradually became combined in the same encyclopaedias.

Collison (1964) and other scholars (Willoughby 1928, Witty 1979) also indicate that certain features, meant to enrich the encyclopaedias and to make the content more accessible, were introduced relatively late in the encyclopaedia tradition. For example, cross-referencing appeared around the 14th century as seen in Domenico Bandini’s *Fons Memorabilium Universi*, and indexing appeared around the 17th century as in Antonio Zara’s *Anatomia Ingeniorum et Scientiarum*.

3.2. Evolution of the development process

In a continuous effort to achieve the highest standards of quality, the process of developing encyclopaedias became more and more complex over the centuries. The following sections focus in particular on three aspects of encyclopaedia development: the task of creating the content, the task of ensuring the quality of that content, and finally, the task of keeping encyclopaedias up-to-date.

3.2.a. Content development

Encyclopaedias have always emphasised text. As mentioned earlier in Section 1 of this chapter, the early encyclopaedic efforts started with a phase of compilation of existing documents or manuscripts and it was much later that encyclopaedists finally started synthesising the state of knowledge with writings of their own composition. The example of Ephraim Chamber's *Cyclopaedia* which was published in 1728 was cited as the first instance where this practice was thoroughly applied. It was also mentioned in Section 1 of this chapter that the practice gradually became standard in modern encyclopaedias.

Collison (1964) indicates that it was only around the 6th century CE that illustrations were first used to accompany encyclopaedic texts, as seen in encyclopaedias found in the monastery of Monte Cassino, although I wonder whether, for example, some of the Chinese encyclopaedias did allocate space for illustrations much earlier than that because of the importance of calligraphy, drawing and painting in the local culture. I would not be surprised if some of the Chinese encyclopaedias which are not dedicated to administrative matters did not allocate space for reproductions of these arts, either as illustrations of existing texts or as the actual focus of some of these encyclopaedias.

3.2.b. Quality assurance

Generally, the compilation of the early encyclopaedias was entirely conducted by isolated individuals who were often philosophers, scientists, polymaths, or even government officials. Most of the early encyclopaedists undertook the colossal task of writing on a wide variety of topics from their own volition, particularly in the Arab world and in Antique Greece (Collison 1964), although

some encyclopaedists –such as those working in the Imperial China– were appointed by and working under the control of local authorities (BNF 1996b, Godin 1996). In all cases, the fact these encyclopaedists had to generate an incredible volume of writing made the encyclopaedias developed highly vulnerable to errors. A typical example was Pliny’s *Historia Naturalis* which was highly praised and highly plagiarised for many centuries but which actually contained many unverified claims and old wives tales (Gudger 1924, Collison 1964).

When encyclopaedia making became a collaborative work between various dedicated intellectuals, not only the diversity of the coverage increased but also the depth and quality of the content. According to Collison (1964), the first real collaborative encyclopaedia appeared in the 10th century when the Brethren of Purity, a heterodox philosophical group which was active in the Basra region, developed their ‘Epistle’ entitled *Rasa’il Ikhwan as-Safa’ wa Khillan al-Wafa* in an effort to develop an encyclopaedic work in line with the group’s philosophy – a work which was highly valued in the Arab world (Netton 2002). In the case of China, Godin (1996) gives examples of encyclopaedias developed in the 10th century and beyond which each involved the collaboration of thousands of compilers and illustrators. Finally, in the case of Europe, Collison (1964) highlights three innovations which greatly improved quality control in encyclopaedia making: the introduction of a peer review process, the appearance of editorial teams, and the increase in the role played by publishers. In the 13th century, King Alfonso X of Spain introduced the system of peer review in order to control the quality of his encyclopaedic project –the *Grande e General Estoria*– by hiring a team of reviewers in charge of selecting and assessing all materials before sending these materials to appointed professional writers. By the 17th century, philosophers and scientists were often specifically commissioned to write encyclopaedia articles in their respective area of expertise under the careful guidance of one or several editors. This practice has thrived since the 18th century, starting with the development of Didérot and d’Alembert’s *Encyclopédie* (Moureau 1990). When it was obvious that the size of the encyclopaedias and the frequency of their re-editions required increasing efforts from the publishing houses, these later started to have permanent and trained staff dedicated to the publication of encyclopaedias. *Encyclopaedia*

Britannica is the first to be published under such a model. Rapidly, other major encyclopaedias followed, including *Encyclopaedia Americana* in the US, *Conversations Lexicon* (also known as *Brockhaus Enzyklopädie*) in Germany, Larousse's *Grand Dictionnaire Universel* in France, as well as other examples from other countries such as The Netherlands, Denmark, or Russia to name but a few.

3.2.c. Content update

Collison's work indicates that it was only in the 19th centuries that the task of updating content entered the encyclopaedia making process. Before that time, re-edition –as we understand the term today– was not in practice. The early encyclopaedias which were compiled by single authors typically represent decades of works; hence it was unexpected of the original authors to get back to the same work to update its content. Instead, the best of the early encyclopaedias were often illegally plagiarised; for example, for many centuries, many encyclopaedists took material from Pliny's *Historia Naturalis*. With the arrival and progress of the printing technology, some of the past encyclopaedias were reprinted and a few were translated into other languages. In both cases, however, there seemed to be little or no revision of the content. Even in the 17th century Europe, when recycling existing contents for the development of new encyclopaedias became common practice, the encyclopaedists often selected the most appropriate entries without doing any further change. Towards the end of the 18th century, the hiring of entire editorial teams by publishers made it possible to revisit the content of past encyclopaedias and to release updated editions.

The inventory conducted by Collison (1964) also shows that, since the 19th century, many of the large and medium size encyclopaedias had had several editions released, as seen in the case of *Encyclopaedia Britannica*, *Edinburgh Encyclopaedia*, or *London Encyclopaedia* in the UK, as well as *Encyclopaedia Americana*, *Brockhaus Enzyklopädie*, or *Le Grand Dictionnaire Universel* in other countries. Some publishers even tried to release updated editions at regular intervals, for example, the *Chambers's Encyclopaedia: A Dictionary of Universal Knowledge* by William and Robert Chambers undergoes a complete revision

approximately every five years. The challenge was to form a new editorial team for each new edition, so a permanent team was finally formed in 1929 for the continuous revision of *Britannica* (Wood 1977, Auchter 1999, Encyclopaedia Britannica Inc. 2005).

4. Roles of encyclopaedias in society

Although, by definition, encyclopaedias are primarily intended to be a compilation of knowledge; they have played many additional roles throughout history. In particular, encyclopaedias have been used:

- To educate the public;
- To serve as ready-reference;
- To spread culture;
- To preserve national identities; or
- To promote societal changes.

Most of these roles have been observed in each of the various encyclopaedia traditions mentioned in this chapter, although not necessarily in a simultaneous manner or in any particular order of importance. There are also variations in the roles played by the encyclopaedia within different societies and during different periods as described below.

Educational material

When manuscripts were still rare and difficult to access, encyclopaedias were used in lieu of textbooks and were to be read in their entirety for the acquisition of a complete education (Fontaine and Berger 2006). The primary beneficiary of these unique educational materials, however, varied from one country to the other. For example, in Imperial China, encyclopaedias were used for the preparation of Chinese candidates who intended to enter examinations for administrative positions (BNF 1996, Burke 1996, Godin 1996). In Antique Greece and in the Roman Empire, encyclopaedias were designed for the teaching in the Platonic academy, in the Aristotelian lyceum and in the Roman schools (Beyer de Ryke 2003, Doody 2009); whereas in the early Christian Europe, a few titles such as St. Isidore's *Originum seu Etymologiarum Libri XX* were designed to provide a basis for what was called "the Christian education" (Collison 1964).

As discussed earlier, the content of Latin encyclopaedias in the Middle Ages mirrored the *Trivium* and *Quadrivium* curriculum so that they could be used by the religious leaders and scholars attending universities (Willoughby 1928, Stecchini 1962). It is only since the Enlightenment era that the readership of European encyclopaedias has included the general public, and, a century later, some of these works started to be adapted specifically to women and children (Collison 1964). By the 20th century, however, encyclopaedias from all around the world can be divided into two categories: those targeted to the general public, and those aimed at the educated readership (Sills 1962).

Some scholars (Milson 1972, Harvey 2000a, Heck 2002) indicate that, contrary to the traditions discussed above, the Arab encyclopaedias were among the rare examples which were always aimed towards the education of a general public. They argue that Islam in particular encourages individuals to deepen their knowledge according to the needs of their profession: the jurists to focus on the study of the laws, the mystics on the study of spiritual matters, the philosophers on the study of logics, the artists on the study of literary and cultural topics, etc.

Reference material

In fact, encyclopaedias do not need to be read cover to cover but can always be used as reference material. For example, the early Chinese encyclopaedias were designed to provide Chinese administrators with the information they may need in their daily activities (BNF 1996b, Burke 1996, Godin 1996). In Medieval Europe, encyclopaedias were regularly consulted by monks, religious leaders and university scholars regularly during their studies (Willoughby 1928). By the 17th century, clerics, merchants and officials also started to use the encyclopaedia as a source of scientific and technical information relevant to their daily activities. In the 19th century, a few encyclopaedias were even organised in a question-answer fashion to improve their use as ready-reference material (Collison 1964), a practice which was perpetuated in some of the encyclopaedias designed for the popularisation of science designed for the use of children in modern times.

Once the number of books started to grow exponentially since the 15th century – thanks to the arrival of printing– the role of encyclopaedias expanded. Indeed,

encyclopaedias moved away from being simple compilations of existing documents and manuscripts. They also went beyond the compilation of existing knowledge and took the role of reading guide. As Burke writes (1996, p.193) so eloquently, encyclopaedias became necessary to guide the readers “through the ever-growing forest –not to say jungle– of printed knowledge”. The provision of lists of reference and list of readings in modern encyclopaedias is a continuation of that role.

Tool to spread culture

Another use of the encyclopaedia was to spread culture. Some scholars (Collison 1964, Burke 1996, Godin 1998) are even suggesting that encyclopaedia tradition particularly prospered in civilisations where there was a strong desire to impose new cultures on other countries. Sometimes, one culture and civilisation was simply considered superior to that of other countries, but other times, the superior culture and civilisation was imposed on other countries as a form of intellectual imperialism. This can clearly be illustrated in the cases of the Arab civilisation (Bosworth 1963, Lory 1988, Biesterfeldt 2000) where many of the Arab encyclopaedists made clear distinctions between Islamic and non-Islamic science and culture in their works. Not only did the Arabs frequently give more prominence to Islamic science and culture while condemning the non-Islamic ones as heresy; but they also imposed the Islamic science, culture and even faith to all countries they invaded.

Encyclopaedias were also used to spread other religions. For example, Godin (1996) claims that most religions prevalent in the old Indian subcontinent such as Brahmanism, Buddhism, and Jainism, and every philosophical school developed their own encyclopaedias, probably as a tool for teaching their doctrines. In the case of Christianity, it was already discussed in Section 2.1.b. that this religion permeated the majority of the encyclopaedias developed in Europe for many centuries - a practice which allowed religious leaders to successfully preach and spread the Christian faith across the continent.

Following the lead of the French ‘*Encyclopédistes*’ in the 18th century Europe, the domination of the clergy over encyclopaedias started to subside to be rapidly replaced by the ascendancy of the scientists and rationalists. The

prominence of scientific knowledge and scientific culture has become part of the modern encyclopaedias. Some scholars (Barzun 1962, Featherstone and Venn 2006), however, see the way in which science is pervading in modern encyclopaedias as a manifestation of the tyranny of globalisation or even as a form of neo-colonialism. They argue that the standardised scientific knowledge and the scientific culture that encyclopaedias are spreading across the world mostly come from the dominant civilisations, particularly from Western countries. The complaint is that encyclopaedias give little or no space to indigenous and national knowledge and culture which, consequently, may disappear over time.

Tool to promote national identity

Godin (1996) claims that some of the early encyclopaedias were commissioned by rulers as a form of testimonial or legacy of their reign. Godin cites in particular the case of Chinese Emperors who left encyclopaedias behind them in the same way monarchs all over Europe build castles and other monument.

More generally, encyclopaedias were tools used by people in power to counteract unwanted influence from foreign invaders. Indeed, encyclopaedias often encapsulate the essence of a nation's identity: it is a public repository of the local knowledge (Stover 1962), a national archive (Barzun 1962), and a template of the civilisation to bestow to future generations (Stecchini 1962). In Antique Rome, Cato (234-149 BCE) wrote his *Praecepta ad Filium* for his descendants to perpetuate the Roman knowledge, practice and standards of conduct as well as to counteract any influence from the Greek civilisation which Cato considered as a decadent world (Collison 1964). Also, as a reaction to the Goths' invasion of Italy in the Fourth century of our era, Cassiodorus (c. 480-575 CE) write his *Institutiones Divinarium et Humanarum Lectionum* to provide the invaders with an introduction to the Latin knowledge and culture (O'Donnell 1979/1995). Similarly, in 17th century Europe, encyclopaedists started to develop national encyclopaedias which emphasised the local cultures and which were written in the local languages as a way to move away from the Latin influence (Collison 1964). Stecchini (1962) even argued that modern encyclopaedias can be

a tool to counteract the growing trend of globalisation and the tyranny of science discussed earlier in this chapter.

In times of peace, encyclopaedias were used to raise national awareness among local citizens as well as to proclaim national identity in front of other countries. For example, some of the Arab encyclopaedists had been particularly meticulous about promoting knowledge of Arab origin (Bosworth 1963, Prodöhl 2010). In Europe of the late 19th century, encyclopaedias which were paying tribute to national culture have flourished in many countries (Kister 1986). In modern times, the encyclopaedia became a way to proclaim national identity and a sign of national prestige. By the 20th century, virtually every Western country had domestically produced or released at least one national encyclopaedia in their national language (Stecchini 1962). In fact, having national encyclopaedias is still a goal envisioned by many developing countries. Among the celebrated achievements is *Encyclopaedia Hebraica* which was first published in 1949 to mark the creation of the nation of Israel (Harvey 2000a).

Tool to promote societal change

Layton (1965) claims that the early encyclopaedias only started to have an impact on societies one or two centuries after their publication, if at all. There were, however, some encyclopaedias which managed to induce dramatic societal changes in a relatively short period of time. The most successful example was probably the *Encyclopédie* which was intended for the empowerment of the French society (Moureau 1990, Lepape 1991). Indeed, the *Encyclopédie* was designed around the belief that spreading scientific knowledge and promoting an enquiring and critical mind among the general public would offer new ways to tackle societal problems. More importantly, the *Encyclopédie* was designed to free the society from the indoctrination of the Clergy as well as from what the *encyclopédistes* saw as outdated and perverse ideologies from the French Court. The publication of the *Encyclopédie* between 1751 and 1772 was considered as one of the key factors which led to the French revolution of 1789, which indicate that the goal of the *encyclopédistes* were generally achieved (see also Collison 1964, Clark 1992).

But the *Encyclopédie* is not an isolated case. Following the French example, many of the subsequent encyclopaedists, including the authors of the German *Conversations Lexicon* and the authors of the English *Encyclopaedia Britannica*, analysed the needs of their society and tried to provide the required knowledge so that their encyclopaedias can also become tools for societal changes (Barzun 1962, Sills 1962, Stover 1962, Cartwright 1996).

5. Towards an understanding of encyclopaedia authority in general

The long and complex evolution of the encyclopaedia making as described throughout this chapter can be interpreted in a way that hypothesises on how encyclopaedias reach their status of “ultimate authority” over the centuries can be made. These hypotheses are based on the various reflections made pertaining to the concept of authority in general, and the concept of cognitive authority in particular, as discussed in Chapter 1.

The scholars referenced to in this chapter warmly praise past encyclopaedias for the richness of their content, for their contribution to the advancement of knowledge and science and for their positive impacts on society. Pliny’s *Historia Naturalis*, the French *Encyclopédie*, the English *Encyclopaedia Britannica* or the German Brockhaus *Enzyklopädie* are just the most famous examples among many others. Scholars demonstrate that these exceptional encyclopaedias largely merit the reputation and authority they are granted. In light of such praise, it is reasonable to presume that part of the encyclopaedia authority probably came from the quality of encyclopaedia content. But encyclopaedia authority may also have additional grounds.

I would argue that the early encyclopaedias first gained their authority from the fact that they were pioneers in the field of knowledge compilation and they were perceived as superior because of the precious knowledge embedded in them. These are exactly the characteristics defining “*auctoritas*” in Ancient Rome; hence the authority. When educational and reference materials were still scarce, the few existing encyclopaedias had a crucial place in societies and gained a special status: they were the “ultimate references” at that time. Some of these encyclopaedias even remained the ultimate references for several centuries; for example, the Chinese encyclopaedia *Sancai Tuhui* was in use for

more than four centuries (Featherstone and Venn 2006) while Pliny's *Historia Naturalis* was heavily used –and plagiarised by other encyclopaedists– for more than five centuries (Collison 1964). But it is also possible that the perceived superiority of encyclopaedias came from their external appearance or –in some sense– from their “charisma”. Indeed, encyclopaedias were not only typically voluminous works but they were also produced by using the best technology available.

The authority of encyclopaedias also seems to be associated with the authority of their authors. From the beginning, encyclopaedias were typically developed by individuals with a well-established reputation within society. They were polymaths, philosophers, scientists, or religious figures who were considered knowledgeable and authoritative in their fields. The writings produced by these individuals were automatically expected to be authoritative. Moreover, the fact that these individuals were capable of an extraordinarily lengthy and elaborate effort in the process of producing encyclopaedias –particularly when they were working alone– probably reinforced the respect that society granted both these individuals and their works. Later, when more people became involved in the writing, editing, and peer-reviewing of encyclopaedias, these appeared as even more colossal enterprises.

Some of the early encyclopaedias also secured their authority through institutional endorsement. The development of some encyclopaedias was commissioned by individuals and institutions in power such as the ruling Emperors in the case of the early Chinese encyclopaedias or the *Académie Française* and the *Académie des Sciences* in the case of many French encyclopaedias in the 17th and 18th centuries. Similarly, some encyclopaedias became authoritative because they were endorsed by powerful institutions such as the philosophical schools in the Antique India or the Christian clergy in the Medieval Europe. It is also possible that, when publishers started to have permanent editorial teams focusing on the development of specific encyclopaedias (for example in the case of *Encyclopaedia Britannica* or *Brockhaus Enzyklopädie*), the authority of the publishers and the authority of their encyclopaedias intermingled and reinforced one another.

The authority of encyclopaedias is also built from societies' use and past experience with them. It may not have been readily recognised and acknowledged in society but encyclopaedias are *de facto* authorities. Encyclopaedias have spread knowledge to generations of learners, influenced their thinking and induced societal changes. In fact, sometimes, encyclopaedias were probably at the margins of cognitive authority and started leaning towards deontic authority. Some encyclopaedias definitely tried to spread more than “know-what” knowledge and include “know-how”, thereby regulating the behaviour of the public. But it is when encyclopaedias were in the hand of governments as political tools or as instruments for social changes that the public had the most pressure to take the “know-how” knowledge provided in the encyclopaedic text as practical guidelines for doing things. The case of the early Chinese encyclopaedias which were commissioned by the emperors probably falls within this category.

Once encyclopaedias started having authority, this increased from the weight of practice and tradition. It is difficult to forgo several centuries of beliefs regarding the exceptional quality and authority of encyclopaedias –beliefs which were regularly renewed by the release of one or two exceptional and highly successful titles every now and then. My claim is that the authority of these exceptional encyclopaedias was passed on –or more probably rubbed off on– later compilations.

Similarly, the code of practice established throughout the centuries conferred encyclopaedias with the status and authority of an institution. This institution has one unifying vision: the compilation of existing knowledge in written form. The members of this institution apply a similar approach in the commissioning of experts to write encyclopaedia articles or in the intervention of editors for the organisation of the highly collaborative task. The community also agrees with the general standards: the type of encyclopaedia content, the arrangement and layout of the text, the writing style, etc. But beyond the simple institutionalisation of encyclopaedias, the ultimate form of authority is probably the formation of “encyclopaedia empires” as in the case of *Encyclopaedia Britannica* or the German *Brockhaus Enzyklopädie*. Not only do these names represent long-established and highly reputable encyclopaedias, but they also become local *porte-manteau* to designate encyclopaedias in general. In

addition, the huge organisations behind these names dominate the encyclopaedia development industry to the extent that they have the power to influence other developers. Unsurprisingly, some of the major publishers are regularly mentioned in many of the subsequent chapters of this thesis.

CHAPTER 5.

PREVIOUS RESEARCH ON ENCYCLOPAEDIAS: THE CASE OF *WIKIPEDIA*

When I started preparing the literature review for this thesis, I found only a limited number of papers on the authority and quality of traditional encyclopaedias. Most of these papers are on *Encyclopaedia Britannica* and among the earliest ones is a critical and historical study conducted by Phelps (1930). Later, McCabe (1947) praises the accuracy, comprehensiveness and objectivity of the content of *Britannica* in relation to internal editorial practices. Since then, issues with balance in coverage and subject treatment in *Britannica* have been recurrently debated (Roberts 1960, Doyle 1970, Anonymous 1975, Felknor 1975, Rayport 1995). More recently, Hamilton (2003) investigates the usability and effectiveness of the *Britannica* delivery in various formats. There are also a few studies which compare the quality of *Britannica* with that of other encyclopaedias such as *Chambers' Encyclopaedia* (Doyle 1970), *Microsoft Encarta* (Alevizou 2002), and more frequently with the quality of *Wikipedia* (Giles 2005, Nature Publishing Group 2005, 2006, Bell 2007).

By contrast, there is a multitude of research on *Wikipedia*. In addition to “The authority of *Wikipedia*” (Goodwin 2009), there are other papers dealing with the issue of authority, credibility and trustworthiness of *Wikipedia*. Among the most obvious titles are: “*Wikipedia* and authority” (O’Neil 2011), “On the credibility of *Wikipedia*” (Lopes and Carriço 2008), “On trusting *Wikipedia*” (Magnus 2009), and “Trustworthiness of *Wikipedia*” (Remmerswaal 2010). But there are also over one hundred papers which indirectly study different aspects of *Wikipedia* authority and quality.

It was never my intention to conduct a detailed discussion of each of these papers. Instead, I tried to provide a general overview of the state of knowledge regarding the quality and authority of *Wikipedia*. The ultimate goal of this chapter is to illustrate how the issue of authority and quality is addressed in previous research on *Wikipedia* in order to draw lessons for the study of the authority of encyclopaedias in general.

1. Introduction to *Wikipedia*

Launched in 2001, *Wikipedia* is the most popular online encyclopaedia in the 21st century. *Wikipedia* is an initiative through which the Wikimedia Foundation envisions “a world in which every single human being can freely share in the sum of all human knowledge”²³. But *Wikipedia* is different from other encyclopaedias by the process adopted for the creation of its content, by the size of its content, and by its extraordinary popularity among the public. At the same time, *Wikipedia* is at the heart of a heated debate on its value for society.

Unlike traditional encyclopaedias written by commissioned authors and editors following a well-established process, *Wikipedia* is the work of millions of volunteer contributors who are able to instantly create, change, update, and publish encyclopaedia content online through the use of the wiki technology embedded within the site.²⁴ In fact, anyone with an Internet connection can contribute –write, edit, discuss, review and validate entries– regardless of his or her expertise, although some of the most active contributors can also be granted additional editing and administrative privileges to control and promote quality within *Wikipedia* (Bryant *et al.* 2005, Viégas *et al.* 2007a, Panciera *et al.* 2009). Some of these contributors focus on the development of entries on an area of expertise whereas others execute administrative tasks throughout the entire encyclopaedia (Spek *et al.* 2006).

The continuous effort of this large pool of volunteers allows *Wikipedia* to continuously grow and to reach extraordinary proportions (Voß 2005, Zlatić *et al.* 2006, Ortega *et al.* 2008). For example, as of December 2010, the site had

²³ See <http://www.wikimediafoundation.org> (accessed 29 December 2010).

²⁴ See Chapter 6, Section 1.1 on p.134 for additional information on wiki technology.

over 18 million of entries written in 278 languages and covered a great diversity of topics²⁵. The English language *Wikipedia* alone exceeded 3.5 million entries – a number thousands of times superior to the 65,000 entries in the 2010 printed set of the *Encyclopaedia Britannica*²⁶.

As a generic encyclopaedia, *Wikipedia* tries to cover all domains of knowledge, although the founder of *Wikipedia* proudly claimed in a keynote address at the 2006 Wikimania Conference “we are stronger in science than in many other areas” (Jim Wales, quoted in Halavais and Lackaff 2008, p.429). Nonetheless, among the most popular entries within the English language *Wikipedia* are those dedicated to books, films, music and other entertainment topics, as well as those on politics, history and geography (Spoerri 2007a, 2007b).

2. Research on the public use of *Wikipedia*

Previous research indicates that people from different levels of instruction have different use and perception of *Wikipedia* authority. In particular, experts tend to find *Wikipedia* entries more credible, as compared to non-experts evaluating the same entries (Chesney 2006, Lackaff and Cheong 2008, Soylu 2009, Sundin and Francke 2009, Chen 2010, Lucassen and Schraagen 2010, Wannemacher 2011). *Wikipedia* is also perceived differently by people with different background and culture (Chan *et al.* 2010).

Altogether, the public use of *Wikipedia* is remarkable. Since the creation of *Wikipedia* in 2001, its website (*Wikipedia.org*) has become an Internet phenomenon and has rapidly ranked among the top-10 most visited websites in the world. The Alexa web ranking²⁷ shows that *Wikipedia* receives higher traffic than traditional encyclopaedias which are made available on the Internet, including the online version of *Encyclopaedia Britannica* (www.Britanica.com), the *World Book Encyclopaedia* (www.Worldbook.com), the *Hutchinson Encyclopaedia* (www.Encyclopedia.farlex.com) or the *HighBeam Encyclopaedia*

²⁵ See http://meta.wikimedia.org/wiki/List_of_Wikipedias (accessed on December 29th 2010)

²⁶ See <http://www.britannicastore.com/the-encyclopaedia-britannica-home-library-suite-2010-copyright/invnt/printhome10/> (accessed on December 29th 2010)

²⁷ See <http://www.Alexa.com/Topsites/Category/Top/Reference/Encyclopedias> (accessed on December 29th 2010)

(www.Encyclopedia.com) which provides access to entries from highly recognised sources such as the *Columbia Encyclopaedia*. *Wikipedia* also receives higher traffic than any other free online encyclopaedic initiatives such as *Webopedia* (www.Webopedia.com) or *Information Please* (www.Infoplease.com) to name but a few.

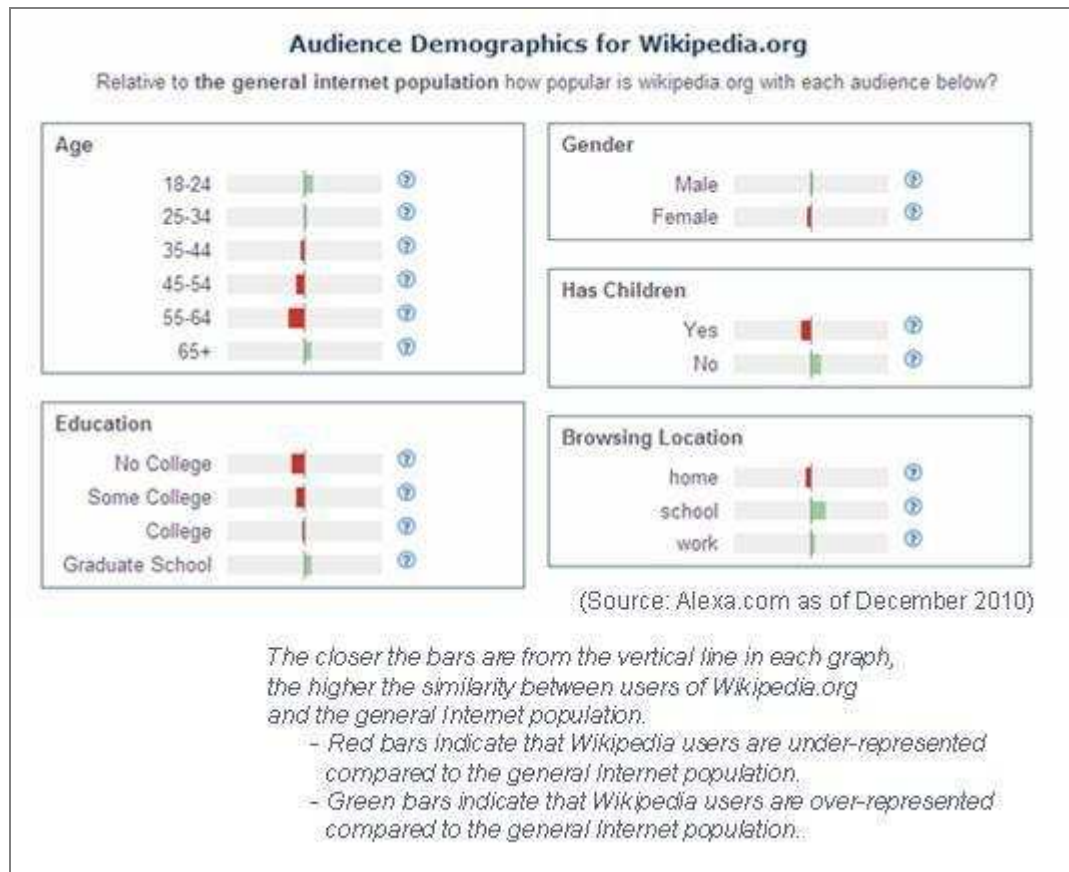


Figure 11. Audience demographics for *Wikipedia.org*

Millions of Internet users from a variety of background are accessing *Wikipedia* every day, particularly those in higher education and –to a lesser extent– those in the professional world (Figure 11 above). University students’ high use of *Wikipedia* as source of information is well documented (Kuznetsov 2006b, Prescott 2006, Lim 2009, Head and Eisenberg 2010). In fact, *Wikipedia* is valued as teaching material (Erickson 2010) and some teachers are actually allowing the use of *Wikipedia* in the classroom, as long as their students are checking the accuracy of all information in primary resources (Chandler and Gregory 2010, Eijkman 2010). Moreover, there is an increasing number of cases where students are asked to write *Wikipedia* entries as part of their assignments (Konieczny 2007, Young 2007, Chandler and Gregory 2010, Kolowich 2011, Wannemacher

2011). Besides, there are members of the academia who are extensively using *Wikipedia* (Snyder 2010). Some lecturers and researchers are even warmly encouraging their peers to join the *Wikipedia* community (O'Donnell 2007, Chen 2010).

The wide use of *Wikipedia* as reference material in the professional world has also been reported (Chen 2009), including in areas where information accuracy is crucial such as in journalism (Lih 2004, Shaw 2008), in court (Richards 2008, Baker 2009, Stoddard 2009, Gerken 2010, Murray and Miller 2010, Peoples 2010) or in the medical world (Lacarova 2008, Grossman 2009, Heilman *et al.* 2011). Even librarians are starting to acknowledge the place of *Wikipedia* within the wide collection of reference works in the 21st century (Lipczynska 2005, Wallace and Van Fleet 2005, Lally and Dunford 2007, Pressley and McCallum 2008, Luyt *et al.* 2010).

Additionally, *Wikipedia* serves as a model for other online encyclopaedias. *Wikipedia* is, however, not the first online encyclopaedia, not even among those initiatives using wiki technology. Indeed, *Wikipedia* emerged from *Nupedia*, one of the first encyclopaedias entirely developed online (Sanger 2005, Korman 2006). Among the successful and less successful encyclopaedic initiatives which are inspired by *Wikipedia* are: *Digital Universe* and its numerous portals (www.digitaluniverse.net), *Citizendum* (www.citizendum.org), and Google's Knol (www.knol.google.com). Even *Britannica* is reported to be contemplating the development of part of its content according to the *Wikipedia* model (Catone 2009).

Despite its high popularity, there is often a reluctance to recommend the use of *Wikipedia*, particularly in academia. Although banning *Wikipedia* from the classroom is considered unrealistic and even undesirable (Johnson 2006, Maehre 2009), there are still many teachers who are proscribing the use of *Wikipedia* in their classroom, sometimes to the extent of penalizing the students who are disregarding the rule (Jaschik 2007, Read 2007, Waters 2007, Soyly 2009). Even some librarians are sceptical about the value of *Wikipedia* as reference material (Fasoldt 2004, Rector 2008). Finally, the debate on *Wikipedia* that scholars had in the *British Dental Journal* (Anonymous 2008b, Kitchen 2009, Shawkat 2009) is

a striking example of the unease regarding the growing use of *Wikipedia* in the professional world.

3. Research on *Wikipedia* quality

Some *Wikipedia* entries are reported to be of high quality, particularly the *Wikipedia* “Featured Articles” (Stvilia 2006, Wilkinson and Huberman 2007), but more often, the quality of *Wikipedia* entries is questioned. All parameters for quality assessment listed in Chapter 2, with the exception of those pertinent to Category 5 on Encyclopaedia Delivery, have been considered in the case of *Wikipedia*.

Criticisms are expressed regarding the completeness and objectivity of the coverage, as well the quality of the information provided in specific entries, particularly the accuracy of these. For example, several studies reveal that the topic coverage within *Wikipedia* is biased towards the common areas of interest of the *Wikipedia* contributors (Holloway *et al.* 2005, Kittur *et al.* 2009, Royal and Kapila 2009). On the one hand, some entries—which are currently benefiting from considerable effort from the contributors and which are allocated a relatively large amount space within *Wikipedia*— may not be worthy of encyclopaedic coverage. Among the extreme examples are the articles dedicated to fictional characters such as those from the franchise game *Pokémon* (Anonymous 2008a) or from the television series *Star Trek* (Greenstein 2007). On the other hand, there are gaps identified in the existing coverage. Many entries are left in an embryonic stage. Some topics are left totally untouched, even within areas of science which are supposed to be the strength of *Wikipedia* (for example, Halavais and Lackaff 2008 identify gaps in the coverage of medicine). Additionally, *Wikipedia* is suffering from mass deletion and errors which are regularly and deliberately introduced by vandals (Viégas *et al.* 2004, Brandes and Lerner 2007, Priedhorsky *et al.* 2007). But one of the most common complaints concerns the number of inaccuracies found within the *Wikipedia* entries, particularly those pertaining to current affairs and to the biography of famous people, as reported in various anecdotal evidence (Groznic 2004, McHenry 2004, and 2005, Hafner 2006, Greenstein 2007, Waters 2007).

The issue of inaccuracies is also reported in various empirical studies (Clauson *et al.* 2008, Rector 2008).

However, not all studies of accuracy of *Wikipedia* entries are negative. Among the earliest empirical studies is one which compares the accuracy of content in *Wikipedia* and in *Encyclopaedia Britannica* (Giles 2005, Nature Publishing Group 2005). This study judges in favour of *Wikipedia*, although the results are questioned on the basis of potential flaws in the research methodology (Encyclopaedia Britannica Inc. 2006b, 2006a, Nature Publishing Group 2006). Several subsequent studies analyse different *Wikipedia* entries and report satisfactory levels of accuracy (Rosenzweig 2006, Devgan *et al.* 2007, Younger 2010). Other researchers who study *Wikipedia* quality also look at other aspects of quality, such as the writing style (Lih 2004, Emigh and Herring 2005, Elia 2006), the type of the citation used (Aarup Nielsen 2007), or the system of tagging and classification of the entries (Voss 2006, Nastase and Strube 2008). Finally, there are studies which discuss how quality is ensured in *Wikipedia*, particularly from the organisational aspect of the encyclopaedia development (Kittur *et al.* 2007, Viégas *et al.* 2007, Wilkinson and Huberman 2007, Butler *et al.* 2008, Kittur and Kraut 2008).

Additionally, there is a growing body of research which is dedicated towards the development of new approaches to measure *Wikipedia* quality. These range from simple techniques based on the use word count as a proxy for content quality (Blumenstock 2008) to complex mathematical models (e.g. Viégas *et al.* 2004, Holloway *et al.* 2005, Biuk-Aghai 2006, McGuinness *et al.* 2006, Brandes and Lerner 2007). Many of these techniques typically address only a small number of parameters. For example, Emigh and Herring (2005) compute the occurrence of personal pronouns and contractions and used this as a proxy to assess the writing style; Lih (2004) uses metrics such as the number of edits to measure the level of effort to produce the text, whereas complex models and algorithms have been developed to evaluate the credibility of online encyclopaedias (Chesney 2006, Dondio *et al.* 2006, Zeng *et al.* 2006). Additionally, there are efforts to develop visuals indicating potential quality issues within *Wikipedia* entries, as results of “edit wars” for instance (Viégas *et al.* 2004, Kittur *et al.* 2009).

Clearly, the quality of *Wikipedia* entries is strongly linked with the profile of *Wikipedia* contributors. For instance, it is indicated earlier that the areas of interest and motivation of the contributors affects the content of the entries. Unsurprisingly, researchers suggest that, in order to increase the quality of *Wikipedia* entries, the type of contributors intervening should be diversified (Arazy *et al.* 2011) and that the number of subject specialists should be increased (Stein and Hess 2007).

The quality of *Wikipedia* entries is also linked with the efficiency of the *Wikipedia* development process. *Wikipedia* operates under the principle – widespread among likewise open source projects– that “given enough eyeballs, all bugs are shallow” (Levack 2003); in other words, the intervention of an increasing number of well-intentioned contributors would capture “the wisdom of the crowd”. This principle is, however, not reliable and some open source projects have definitely failed to develop quality products (Duguid 2006). In the case of *Wikipedia* in particular, it is argued that it is not the voice of the most knowledgeable contributors which ends up within *Wikipedia* entries (Sanger 2004, 2009) rather the voice of those who come up with the most convincing references (Garfinkel 2008), those who have the most experience writing for *Wikipedia* (Stein and Hess 2007) or even those who spend the most time on the site and who “yell the loudest” (Schiff 2006). Moreover, although *Wikipedia* has some form of administrative system to coordinate the work of the hundreds of contributors, to allow them to reach a consensus in case of conflicts, to control the quality of the entries, and to fight the disruptions made by vandals (Reagle Jr. 2004, Emigh and Herring 2005, Spek *et al.* 2006, Reagle Jr. 2007, Viégas *et al.* 2007b, Stvilia *et al.* 2008, Lichtenstein and Parker 2009), running this system is arduous, time consuming and not always successful (Kittur *et al.* 2007, Viégas *et al.* 2007b, Butler *et al.* 2008, Forte and Bruckman 2008, Kittur and Kraut 2008, Forte *et al.* 2009).

4. Research on *Wikipedia* authority

4.1. Authority of the contributors

Considering that each *Wikipedia* entry is typically developed by a large pool of anonymous contributors, the task of objectively measuring their authority is

complex. In past research, the assessment of the authority of *Wikipedia* contributors occurs at two levels: at the level of individuals and at the level of the community. In general, there seems to be more emphasis on the trustworthiness of the *Wikipedia* community and on the level of involvement of individual contributors than on the subject expertise of these latter (Figure 12).

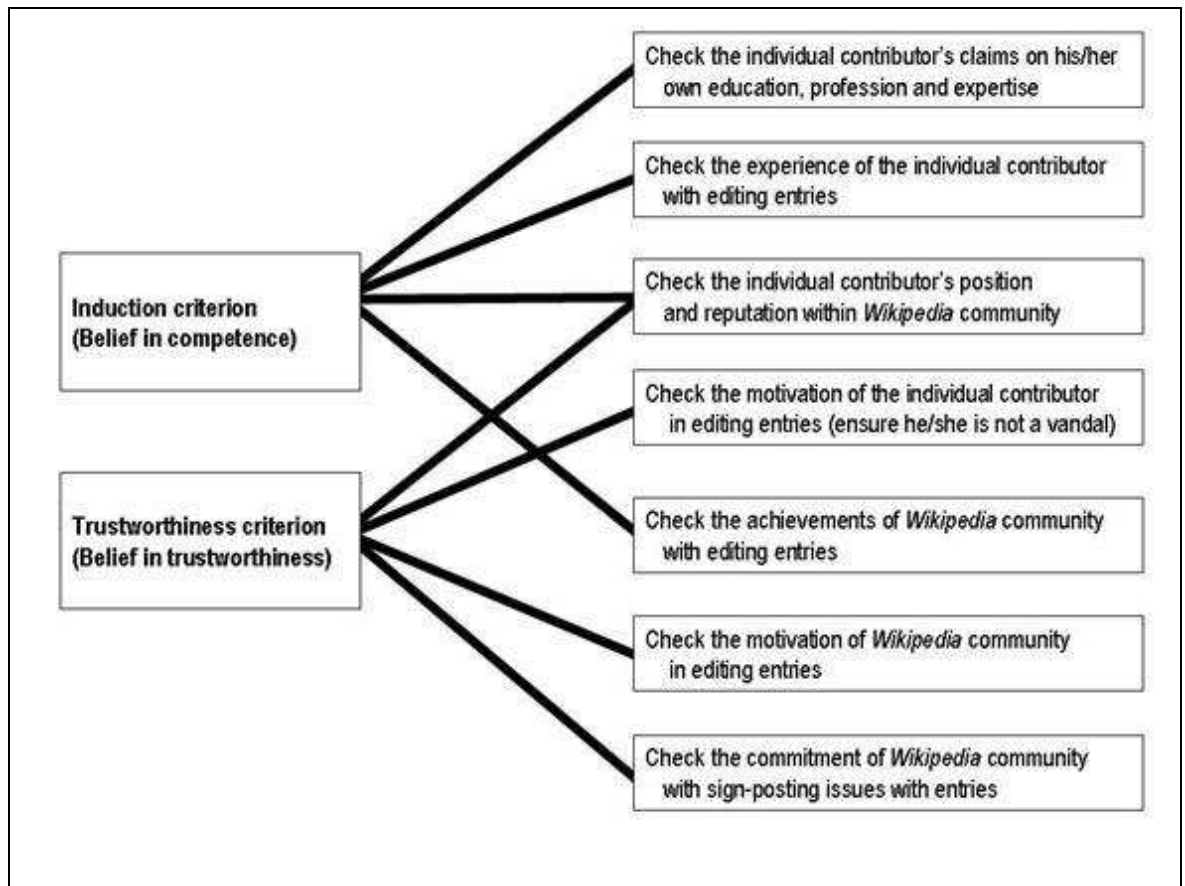


Figure 12. Basis of the authority of *Wikipedia* contributors

The authority of individual contributors can be assessed from the claims made in the users' pages and entries talk pages (Oxley *et al.* 2010). Indeed, some contributors not only provide their name and profession, but also additional information on their areas of interest and expertise. However, Goodwin (2009) claims that, in the case of *Wikipedia*, the authority of individual contributors should not be credited based on their level of expertise but on their motivation and degree of involvement within the *Wikipedia* community. Goodwin's claim is supported by many researchers. It is reported, for instance, that individual contributors can build their edit history, thereby gaining some form of credit (Bryant *et al.* 2005, Forte and Bruckman 2005). Individual contributors can also take on administrative positions and play leadership roles within the *Wikipedia*

community (Reagle Jr. 2007, Burke and Kraut 2008, Panciera *et al.* 2009). In fact, it is argued that having authority within the community is a combination of the contributor's skills and level of participation as well as the contributor's leadership status (O'Neil 2009a, 2009b, 2011). There are even mathematical algorithms developed to compute the reputation of individual *Wikipedia* contributors (Adler and de Alfaro 2007).

The *Wikipedia* community as a whole can also be considered as contributors with a certain degree of authority. The mere fact that the *Wikipedia* community manages to produce an incredible number of encyclopaedic entries warrants respect (Spinellis and Louridas 2008). Despite vandals, jokers and "trolls" who regularly disrupt *Wikipedia* entries (Viégas *et al.* 2004, Svoboda 2006, Priedhorsky *et al.* 2007), the community in general is reported to be highly motivated and very dedicated to the production of the best knowledge (Kuznetsov 2006a, Nov 2007, Wagner and Prasarnphanich 2007). Moreover, the community is considered trustworthy because it is not trying to deceive the readers by explicitly sign-posting known weaknesses on existing *Wikipedia* entries with tags such as "The neutrality of this article is disputed" or "This article requires authentication or verification by an expert".

Nevertheless, the authority of *Wikipedia* contributors is often contested. At the individual level, many contributors remain anonymous, use pseudonyms or sign their edits with computer IP addresses. But even when contributors provide personal information, there is no guarantee that such information is actually correct. So, it is hardly surprising that there is a reluctance to trust encyclopaedic entries from unknown contributors (McHenry 2004, Lucky 2007). At a broader level, there are criticisms regarding the composition and functioning of the community. For instance, there are concerns that *Wikipedia* might be "anti-elitist" and might discourage the participation of experts by refusing to give special recognitions and privileges to contributing experts on the basis of their status (Sanger 2004 and 2009, Denning *et al.* 2005). There are also concerns about perceived unfairness towards "newbies" and anonymous contributors (Adler and de Alfaro 2007, Viégas *et al.* 2007a, Butler *et al.* 2008, Forte *et al.* 2009, Kostakis 2010). Some researchers are even denouncing some abuse of power by *Wikipedia* contributors with administrative status (Kostakis 2010).

4.2. Authority of the encyclopaedia in general

Although members of the public seem to have limited concerns about assessing the authority of *Wikipedia* contributors, they seem to care more about assessing the authority of various entries within *Wikipedia*. For this, they are reported to use different features of the encyclopaedia such as bibliographic references and illustrations (Richman and Wu 2008, Lucassen and Schraagen 2010) as well as textual features such as the plausibility of the writing style (Magnus 2009), or the density of hyperlinks and footnotes (Lambert 2005). The various claims and warnings posted throughout *Wikipedia* regarding the quality and trustworthiness of the entries are also used (Goodwin 2009). Additionally, some members of the public are reported to be referring to their prior knowledge in order to assess the quality and trustworthiness of *Wikipedia* entries based on perceived plausibility (Chan *et al.* 2010).

As in the case of measuring the quality of *Wikipedia*, there are researchers who dedicate efforts to the development of tools intended to help the public get automatic information on the authority of specific entries. The development of visuals and trust tabs to indicate the trustworthiness of the content (Dondio *et al.* 2006, McGuinness *et al.* 2006) are typical examples of such efforts.

Looking further into the basis of *Wikipedia* authority, some researchers link it closely to the profile and number of individual contributors involved in the editing of the various entries. For instance, Javanmardi and her collaborators (2009) reports that the ratio between registered and unregistered contributors directly affects the level of trustworthiness of *Wikipedia* entries. Similarly, Pellegrini and Gao (2009) as well as Stein and Hess (2007) highlight the importance of the contribution by “primary contributors” –or experienced authors contributing with a reputation for high quality contributions– in each entry. Korfiatis and his colleagues (2006) notice that the complexity of the network of contributors involved is also playing a determinant role in the authority of *Wikipedia*.

But most of the discussion on *Wikipedia* authority revolves around the effectiveness of the development process and on quality of the resulting *Wikipedia* entries (Figure 13). Section 3 above already covers these points in

great extent. Suffice to say here that when researchers are assessing *Wikipedia* authority based on the quality of the content, they come up with different verdicts. For instance, Goodwin (2009) claims that *Wikipedia* as a whole is an authoritative reference material and argues that, regardless of the numerous shortcomings in the *Wikipedia* content, the public routinely goes back to *Wikipedia* when looking for information. By contrast, other researchers express more reserve and claim that some of the *Wikipedia* entries are more authoritative than others (e.g. Svoboda 2006, Chan *et al.* 2010). Magnus (2009, p.74) even states that, considering the inconsistencies between the various entries, “it is wrong to ask for a monolithic verdict on *Wikipedia*”. At times, a few researchers even refuse to recognise any form of authority in *Wikipedia* (e.g. McHenry 2004, Denning *et al.* 2005, Kitchen 2009).

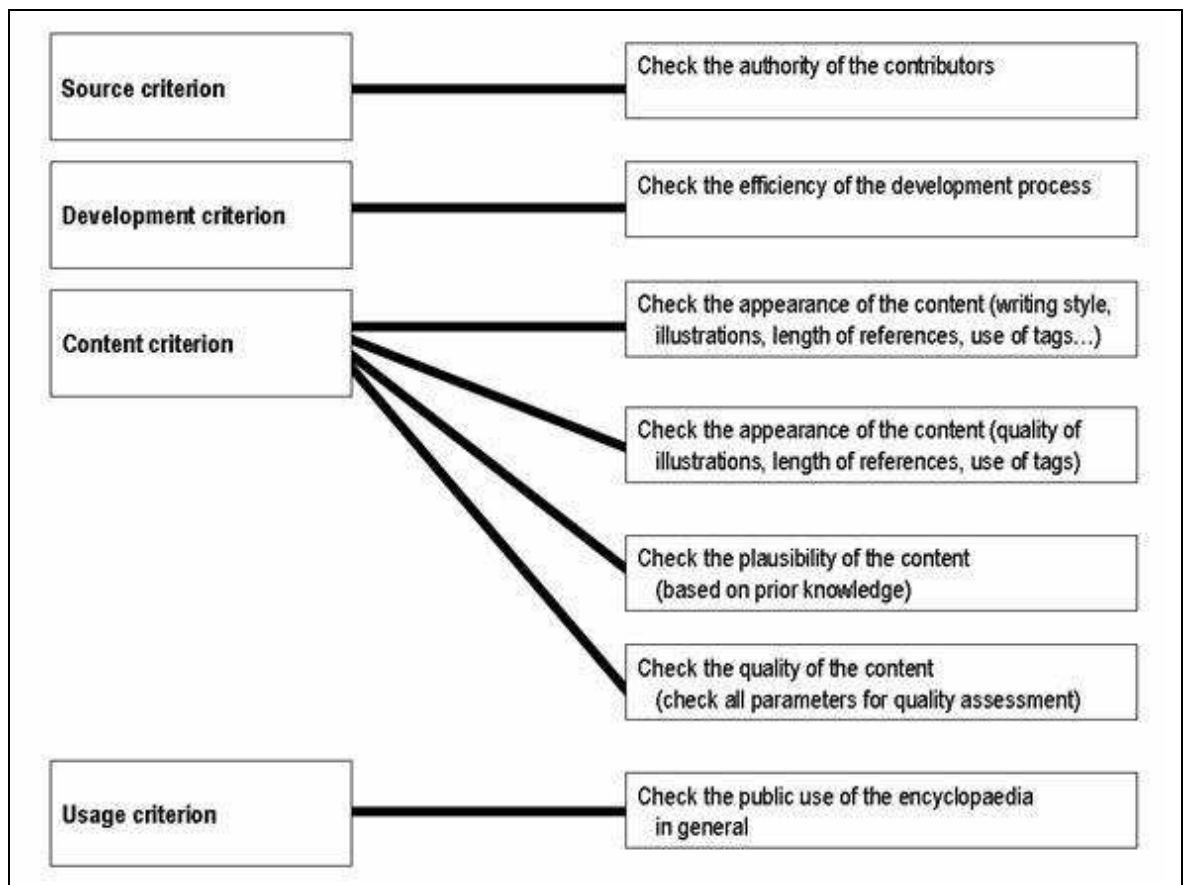


Figure 13. Basis of the authority of *Wikipedia* in general

5. Towards an understanding of encyclopaedia authority in general

The current chapter indicates that the parameters for quality assessment as described in Chapter 2 can directly be used in *Wikipedia* with most emphasis put on the parameters pertaining to the quality of the encyclopaedia content. It may be expected that the same emphasis applies to the study of the quality of encyclopaedias in general. The parameters pertaining to encyclopaedia delivery seemed overlooked in the case of *Wikipedia* but they could be of more importance in the case of traditional encyclopaedias. Because *Wikipedia* is primarily a free online material, discussion around cost or alternative formats may be seen superfluous. By contrast, discussion around cost and alternative formats may be highly relevant for voluminous and expensive printed materials.

There is little mention of the concept of cognitive [epistemic] authority in previous research on *Wikipedia*; yet, the various approaches to assess authority as described in Chapter 1 seems to generally apply to *Wikipedia* despite some criteria which seem redundant and other criteria which require adjustments. Regarding the authority of *Wikipedia* contributors, the suggestions made regarding the identification and justification of cognitive authority in individuals can be used;²⁸ except that the focus seems to be solely on the induction criterion and the trustworthiness criterion. Because of existing peculiarities of *Wikipedia* –the collaborative development model and, more specifically, the high level of anonymity among the contributors– the approaches described in Chapter 1 regarding induction criterion and the trustworthiness criterion have to be modified once applied to *Wikipedia*. To reiterate what is said earlier in Section 4, the authority is more based on emphasis on the trustworthiness of the *Wikipedia* community and on the level of involvement of individual contributors than on the subject expertise they hold. The approach adopted in *Wikipedia* could probably be used for the assessment of the authority of other user-generated encyclopaedias but in the case of traditional encyclopaedias, the authority of contributors should probably be assessed using the approach suggested in Chapter 1 for the induction criterion and the trustworthiness criterion.

²⁸ See Chapter 1, Section 3.2 on p.24

When checking the appropriateness of the various approaches suggested for the assessment of the authority of text as described in Chapter 1,²⁹ there seem to be several criteria taken for granted or considered irrelevant in the case of *Wikipedia*. For instance, the genre criterion is also superfluous since *Wikipedia* –along with many other encyclopaedia– falls within a genre considered authoritative by most people. In the case of *Wikipedia*, there is no mention of the publisher or of endorsing institutions because these do not seem of great relevance. In the case of traditional encyclopaedias, the endorsement criteria may however be applicable.

But the greatest contribution of this chapter is probably the emphasis put on the importance of content quality in the concept of authority. Indeed, previous research on *Wikipedia* highlight highlights the fact that the perceived quality of the content influences the public perception and use; ultimately defining the authority of the encyclopaedia.

Finally, previous research on *Wikipedia* indicate that, beyond the theory of cognitive authority and the theory of quality assessment, there seem to be other theories pertinent to the study authority of encyclopaedias. For instance, a few papers mention the authority of experts (Sanger 2009), the authority of truth (Garfinkel 2008), the authority of argument (Goodwin 2009), and theories on trust and credibility (Chesney 2006, Dondio *et al.* 2006). Exploring these numerous theories go beyond the scope of the current thesis which focuses solely on the theory of cognitive authority and the theory of quality assessment as described in the methodology chapter.

²⁹ See Chapter 1, Section 4.2 on p.36

CHAPTER 6.

ENCYCLOPAEDIA INDUSTRY

Chapter 4 indicates that English language encyclopaedias have thrived over the centuries. Considering that the general attention now seems to be primarily directed at *Wikipedia*, one wonders about the latest status of the encyclopaedia industry. The current chapter tries to answer that question. To set the scene, the chapter starts with an overview of modern challenges in encyclopaedia development and a brief analysis of potential change in the place of encyclopaedias in society, more specifically in libraries. The chapter then inventories the English language encyclopaedias published from the year 1900 to 2009 within library records from the WorldCat database, the world's largest bibliographic database as of 31st August 2010 (details on the methodology adopted are provided in Chapter 3, Section 3.1 starting on p.71). The chapter not only offers a brief estimation of the importance of encyclopaedias comparative to other non-fiction books, it also describes these encyclopaedias: the publishing format, the year of publication, the origin, and the topic coverage. Some general predictions regarding the future of English language encyclopaedias in the 21st century are also made.

1. Introduction to modern encyclopaedias

The definition of and standards used in modern encyclopaedias have already been covered in earlier chapter of the thesis. But before investigating the status of English language encyclopaedias in the 20th and 21st century, an understanding of the general context is needed –in particular, any challenge which may affect the development of encyclopaedias or the dissemination of encyclopaedias in society. On this latter point, the challenges faced by modern libraries are

discussed, considering the fact that libraries are among the major purchasers of encyclopaedias (Kister 1981b).

1.1. Development of encyclopaedias

The technological advances which have occurred within the publishing industry since the 20th century have dramatically affected the world of encyclopaedias. Although not a recent phenomenon, electronic publishing –with its plethora of CD-ROMs, e-books, etc.– has become almost unavoidable for the dissemination of knowledge and information (Lancaster 1995, Odlyzko 1997). Online publishing has become equally as inescapable: even the publication of official documents and statistics are more often than not released online (Inman and Picton 2008). Consequently, places dedicated to archiving knowledge such as libraries increasingly do so by considering a variety of formats (Cope and Phillips 2006, Gomez 2008, Deegan and Sutherland 2009).

Electronic publishing offers numerous advantages to both the encyclopaedia publishers and the encyclopaedia users. Some of the encyclopaedia publishers – particularly the major ones– are whole heartedly embracing electronic publishing, for example, *Encyclopaedia Britannica* or *Brockhaus Enzyklopädie* (Zum Hingst 1995, Pang 1998, Auchter 1999, Clark 2001). The public also seems enthusiastic about the change (Landis 1993, Dixon 1994, Randal 1994, Schofield 1994). The possibility to enrich the content of existing materials by incorporating multimedia and hypertext features greatly increases the instructional value and attractiveness of the electronic encyclopaedias (Bruhns 2005). Towards the end of the 20th century, encyclopaedias in multi-media forms are reported to be particularly appealing to secondary pupils and are recognised to encourage them to be more in control of their learning (Wishart 2000). Additionally, publication on the Internet also allows a larger number of users to remotely access encyclopaedia content without the need to go to libraries and to flick through thousands pages of material. And last but not least, because the cost of CD-ROMs, DVDs and subscriptions for online access are generally much inferior to the cost of printed multi-volumes sets, electronic and online encyclopaedias are attractive to the general public, thereby maintaining encyclopaedia sales to a reasonable level (Sally 2008).

But advances in electronic and online publishing also have adverse consequences. For instance, there is a growing concern that electronic and online materials out-compete the printed ones. This concern is exacerbated by the realisation that the public is reading fewer books than in the past centuries (Abel *et al.* 2002, Thompson 2005, Young 2008). The younger generation of readers in particular has a growing preference for skimming texts on screens – either on a computer or on ebook reading devices such as iPad, Kindle, Cybook, etc.– rather than flicking through the pages of voluminous books (Liu 2008). Even major encyclopaedia publishers are worried. The case of *Brockhaus Enzyklopädie* offers an alarming example as it recently stopped being published in print and is now mostly published online (Cohen 2008, Scally 2008).

One additional challenge that encyclopaedia publishers have to face is the competition imposed by the profusion of freely available materials poured onto the Internet. Encyclopaedia publishers have to recover their production costs and to put their printed, electronic and online publications under complex copyright laws (Groome 1886, Breyer 1970, Litman 2006). The argument of asking the public to pay for quality information is hard to sustain in the long term. By the time a given encyclopaedia finally falls into the public domain –the intellectual property rights generally expiring fifty years after the date of publication– its content is too out of date to be attractive or useful for the public. Among the rare exceptions is the case of the 11th edition of *Encyclopaedia Britannica* which was first published in 1910-1911 and which is now accessed by many internet users, free of charge.³⁰ With the expansion of the open source and open content movements (Wiley 1998, Weber 2005), more quality content will be made available for free under various schemes such as the Creative Commons license, Open Content licence, or GNU free documentation licence.

In fact, it was predicted more than a decade ago that “the future of electronic encyclopaedias will be decided on the Internet” (Auchter 1999, p.298). The disappearance of *Microsoft Encarta* gives some indication of the fierce

³⁰ The 11th edition of *Encyclopaedia Britannica* can be accessible from a variety of websites, including from www.1911encyclopedia.org and www.encyclopedia.jrank.org. These two sites actually rank among the most highly visited by Internet users as indicated by the Alexa web ranking (<http://www.alexa.com/topsites/category/Top/Reference/Encyclopedias> as of 31 August 2010)

competition online. *Encarta* was a trademark for the online encyclopaedia³¹ that the Microsoft Corporation created in 1993 after the purchase of various prestigious encyclopaedias, including the *Funk & Wagnalls Encyclopedia*, the *Collier's Encyclopedia* and Macmillan's *New Merit Scholar's Encyclopedia*. *Encarta* was a leading online encyclopaedia for many years (Mooney 1996, Alevizou 2002) and the Alexa web ranking indicated that *Encarta* was among the most visited online encyclopaedias until the *Encarta* site was suddenly closed in 2009. Many journalists (e.g. Alderman 2009, Protalinski 2009, Stross 2009) speculate that it was the competition from *Wikipedia* and the abundance of free online information available from search engines such as Google which finally lead to *Encarta's* disappearance.

Another important revolution that technological advances bring to the encyclopaedia development concerns the authors and the way in which they work with their editors. The traditional model of author-editor relations, as seen in the case of *Britannica*, can be described as

short periods of intense contact to one in which authors provide *Britannica* with a continuous service, and from one that revolved around writing to one defined by the sharing of expertise.... once an article was published, it might not be handled again for a decade (Pang 1998).

Today, the production of electronic and online encyclopaedias accelerates the pace of content development and obliges authors and editors to revisit and update existing materials more often than ever before. As a consequence, it is speculated that

authors will not be people who create specific pieces of work, but people with whom *Britannica* contracts for ongoing performances: their duties will revolve less around writing, than providing a variety of services that guarantee the accuracy and timeliness of a subject in which they are expert (Pang 1998).

A more dramatic revolution is caused by the arrival of Web 2.0 –which allows Internet users to collaborate online– and more particularly by the arrival of Wiki technology –which allows the creation of user-generated content (Aguiton and Cardon 2007, Anderson 2007, O'Reilly 2007). Basically, Wiki technology offers special features which make it possible for various users to edit the same document stored online, to view the edit history, to access past versions of the

³¹ See www.encarta.msn.com

document, as well as to communicate among themselves and to coordinate their work. *Wikipedia* is one of the most famous wiki-based user-generated online encyclopaedias, although it is not the first as it emerged from an earlier attempt called *Nupedia* (Sanger 2005). There are many others examples, including *Everything2* (www.everything2.com), *Medpedia* (www.medpedia.com), or *Encyclopaedia of Earth* (www.eoe.org) to name but a few. Some of these encyclopaedias are developed by experts who are registered on the site but others encyclopaedias are developed by a pool of anonymous volunteers (Wagner and Prasarnphanich 2007) –an unprecedented phenomenon in encyclopaedia making.

1.2. Place of encyclopaedias in libraries

1.2.a. Encyclopaedia acquisition

Although libraries sometimes acquire materials from donations, they generally have to purchase materials through library suppliers, general and subject specialist booksellers, or second-hand and antiquarian booksellers (Spiller 1991). In the case of reference materials which need to be as current as possible, donation is almost never an option. And because encyclopaedias are relatively expensive compared to other publications, their purchase is very easily affected by budgetary limitations. For instance, a decrease in the US Federal Aid to education and in the amount of funding made available to libraries in the 1970s and 1980s resulted in a decrease in the number of encyclopaedias purchased by US libraries (Kister 1981b, Lee 1993).

The acquisition of general and introductory materials such as encyclopaedias also depends on whether the library is prioritising learning and teaching, or research (e.g. see the Dearing Report by the National Committee of Inquiry into Higher Education 1997). Typically in most libraries, the fund allocated to the purchase of reference materials remains relatively modest. For example, the annual statistics published by the Library and Information Statistic Units (cited in Spiller 2000) indicate that, for the year 1998, 4.1 percent of the acquisition budget of university libraries in the UK is allocated to reference materials

(comprising not only encyclopaedias but also dictionaries, etc.) and 4.8 percent in public libraries³².

By the end of the 20th century, it is reported that there is some pressure on librarians to increase their use of the free resources available on the Internet as a way of saving library funding (Zumalt and Pasicznyuk 1998, Muchin 1999). Examples of suggested alternatives are online reference materials such as *Information Please*, (www.informationplease.com), *OneLook Dictionaries* (www.onelook.com) as well as governmental online databases and directories.

1.2.b. Encyclopaedia use

Regarding the use of encyclopaedias within libraries, it is reported that throughout most of the 20th century, the practice is popular among pupils, particularly those in secondary schools and that some teachers are even planning their pupils' assignments with a specific encyclopaedia title in mind (Horrocks 1981, Kister 1981a). However, the heaviest encyclopaedia users remain the librarians who consult both generic and specialised encyclopaedias on a daily basis in their tasks of answering queries from library users (Grogan 1987, Jackman 1989, Huett 1990, Grogan 1992, Katz 1992b). Librarians also tend to recommend the use of encyclopaedias to people visiting their libraries.

Ironically, encyclopaedias also suffer from their own success. For example, the use of encyclopaedias is forbidden in some schools because of the fear that pupils would stop using other resources (Collison 1964, Horrocks 1981, Kister 1981a). A professor of education at the State University of New York at Brockport was even reported saying in 1976 that encyclopaedias "can have a detrimental effect on the development of a child's ability to search and learn to use the full library" (Robbert Ribble quoted in Kister 1981b, p.12). By the 1980s, there was such a growing snobbism towards encyclopaedias whereby many people started to believe that, because of the ease of information retrieval, that encyclopaedia use was restricted to "children and simpletons" (Kister 1981b). This probably explains why journalists of that time were less and less keen to cite encyclopaedias as a source of information in their articles (Block 1984).

³² Spiller (2000) adds that both figures are representative of UK library expenditure for the last decade of the 20th century

In the case of university libraries, the decrease in the use of printed encyclopaedias and other printed reference materials since the late 20th century is extensively documented. This decrease is, for instance, demonstrated in a study conducted throughout the 1990s at the University of Wisconsin-Eau Claire which showed that reference works were largely underutilized and that half of the reference books within the university library had been used no more than one time in five years (Tenopir and Ennis 2001). This decrease is confirmed in numerous studies conducted in over 120 libraries across the US and Canada between the years 1990 and 2005 (Havener 1988, 1991, Devlin and Burke 1997, Lynn 1999, Feinberg 2001, Bradford 2005). Considering the similarities in lifestyles in modern countries, it is reasonable to assume that a similar decrease in the use of encyclopaedias is occurring in Europe, North America, and other parts of the world. Evidence, for example, is provided in the case of Scottish libraries (Smith and Templeton 1999).

The decrease in the use of printed materials is commonly explained by the growing use of the Internet as primary source of information (Calhoun *et al.* 2009) –a situation which reinforces what is said earlier. Online encyclopaedias are more used than the printed ones by school children and by the general public (Bruhns 2005, Lanning and Turner 2010). Library staff are also increasing their use of online encyclopaedias. For instance, it is reported that, even in the 1990s, some librarians use online references more often than printed ones (Lynn 1999, Bradford 2005). Because of their extended experience with evaluating information quality, librarians are better armed than other members of the public to extract what the Internet has best to offer. Although online search may take longer to complete than a search through the printed materials, librarians reported that online searches allowed them to provide better answers to the people coming to the library (Smith and Templeton 1999).

2. English language encyclopaedias: Previous inventories for the 20th and early 21st centuries

The inventory conducted by Collison (1964) included some encyclopaedias published in the 20th century. As mentioned in Chapter 4, this inventory only covered the first half of the century and tended to miss the titles published

outside Europe. In fact, an inventory of the reference works developed in Asia until the first half of the 20th century listed 22 encyclopaedias (Garde 1956), none of which are found in Collison's list. There are library and information specialists who also conduct encyclopaedia inventories in the 20th century. These include Kenneth Harrison (1964), Bohdan Wynar (1970, 2000), Kenneth Kister (1981b, 1986), William Katz (1992a), or Marion Sader and Amy Lewis (1995) to cite some of the most known. Some of these people update their inventories at relatively regular intervals, although the most prolific of them is probably Albert Walford who published various editions of his *Guide to Reference Material*, alone (e.g. Walford 1959, 1966-1970, 1973, 1981) or with other editors (e.g. Walford and Mullay 1996 and 1999, Lester and Walford 2005). Additional encyclopaedia inventories are released by institutions: for example, the American Library Association's *Subject Guide to Reference Books* (Hirshberg 1942), the American Library Association's *Guide to Reference Books* (Kroeger 1902, Mudge - from 1910 to 1936, Shores 1937, 1939, Winchell 1967, Balay 1992, 1996, Kieft 2008) or the *American Reference Books Annual* (edited every year since 1970, now available online at www.arba.org). Most of these lists are, however, limited to selected 20th century encyclopaedia titles which are particularly recommended to librarians for purchase. Moreover, there is greater emphasis on generic encyclopaedias than on specialised ones.

Regarding online encyclopaedias, there are a few websites which offer some form of inventory, particularly for encyclopaedias that are freely available. For instance, there are 121 free online encyclopaedias in English language listed in the *Wikipedia* entry on 'List of online encyclopaedias'³³ and 69 online encyclopaedias listed in the Alexa Web Ranking.³⁴

3. English language encyclopaedias: Systematic inventory for the 20th and early 21st centuries

In order to answer the question "how many encyclopaedias are there in libraries?", an analysis of the WorldCat database was conducted. The WorldCat

³³ See http://en.wikipedia.org/wiki/List_of_online_encyclopedias (accessed on August 31st 2010)

³⁴ See <http://www.alexa.com/topsites/category/Top/Reference/Encyclopedias> (accessed on August 31st 2010)

database offers a snapshot of the English language encyclopaedias within library catalogues at a specific time. But it is also possible to extrapolate from the WorldCat database in order to investigate and follow the trends in the encyclopaedia publishing industry, particularly if one assumes that the titles within library catalogues are representative samples of the titles released by publishers for any given year. With these considerations in mind, the following sections should be seen as both an overview of the state library collection on 31st August 2010 and an overview of the evolution of the publishing industry from 1900 to 2009.

3.1. Counting of library records

As of 31st August 2010, the WorldCat database had 176,211 library records pertaining to English language materials in various formats, published from 1900 to 2009, and with the words ‘encyclopaedia’ or ‘encyclopedia’ in their title. These records do not actually encompass all encyclopaedic materials since the words ‘encyclopaedia’ or ‘encyclopedia’ are not always present in the titles (for example, there are many encyclopaedic works which are entitled “companion” and “dictionary”, etc.). Thus, although the current chapter does not provide a comprehensive inventory of all encyclopaedias, it still offers an overview of the place of encyclopaedias in 21st century libraries.

In general, encyclopaedias represented a relatively small portion of non-fiction materials within libraries. The WorldCat database listed 54,624,596 library records corresponding to non-fiction books published from 1900 to 2009. So, there were approximately three library records on encyclopaedias for every 1,000 records on non-fiction books. The two types of publications generally displayed comparable patterns when it came to the distribution of the number of records published each year as discussed below (see Figure 14 and Figure 15).

The time distribution of English language encyclopaedias within the WorldCat database indicates some fluctuations in the number of encyclopaedias actually published every year. First, there was a period of slow production in the first half of the 20th century, with the worst period occurring in the years around the two World Wars, followed by a period of gradual improvement from the 1950s to the 1970s. Then, in the late 1970s and early 1980s, the encyclopaedia

production went through another down turn. From the mid-1980s until the end of the 20th century, encyclopaedia publishing seemed to recover and reached its peak around the year 2000, before decreasing again in the 21st century.

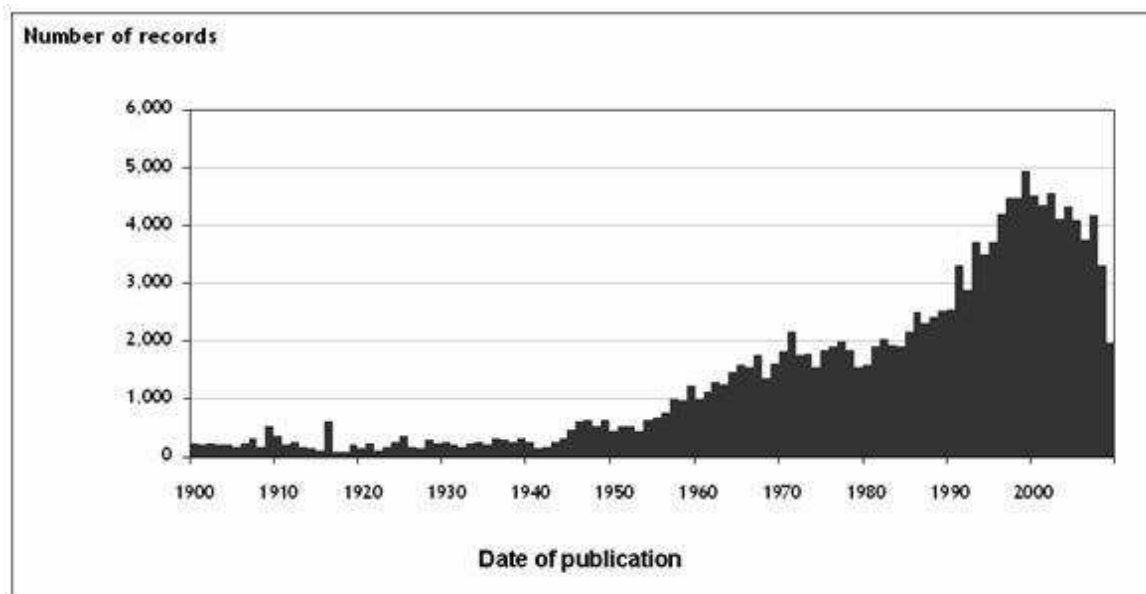


Figure created from 176,211 library records with "encyclopaedia" or "encyclopedia" in the title (WorldCat, 31st August 2010)

Figure 14. English language encyclopaedias listed in library catalogues

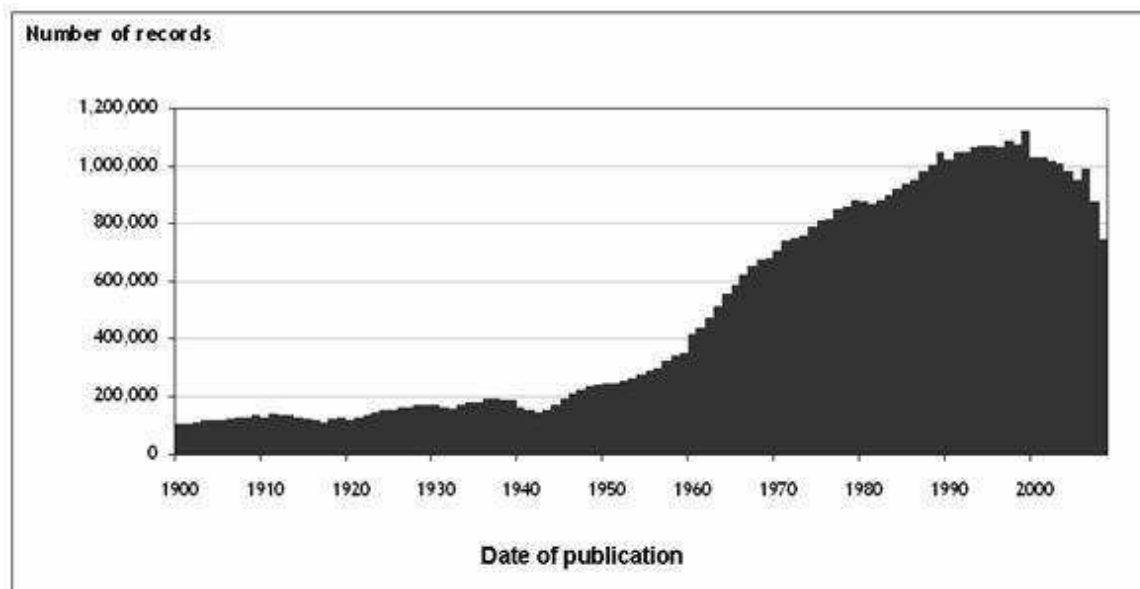


Figure created from 54,624,596 library records on non-fiction books (WorldCat, 31st August 2010)

Figure 15. English language non-fiction books listed in library catalogues

A cursory comparison between Figure 14 and Figure 15 indicates that the fluctuations in the number of encyclopaedias mirror the changes occurring in non-fiction publishing in general. This was probably because both industries display similar responses to the global economic situation. The only notable difference is observed in the late 1970s and early 1980s when encyclopaedia printing seemed to slow down whereas the publishing of non-fiction books continued to grow in a steady fashion.

3.2. Description of library records

3.2.a. Format of publication

Despite the concerns raised in Section 1.1 regarding printed encyclopaedias being potentially replaced by online materials, printed encyclopaedias still largely dominated my sample (Table 4). Indeed, they represented up to 86.44 percent of the 176,211 library records. By contrast, electronic and online encyclopaedias represented 11.95 percent of my sample and support materials such as visuals, sound recordings, maps and music scores, barely 1.63 percent.

Table 4. Formats of English language encyclopaedias

Format		Number of library records	Percentage
Printed materials	Books	149,383	84.78%
	Serials	2,460	1.40%
	Updated resources	390	0.22%
	Archives	62	0.04%
Computer files and online materials	Online resources	18,092	10.27%
	Computer files	2,953	1.68%
Support materials	Visuals	1,615	0.92%
	Sound recordings	579	0.33%
	Maps	358	0.20%
	Scores	319.....	0.18%
Total		176,211.....	100.00%

Table created from 176,211 library records
(WorldCat database, 31st August 2010)

Printed materials: As many as 84.78 percent of the library records on encyclopaedias were entered as books, another 1.40 percent as serials, and only 0.22 percent as updated resources. These latter were loose-leaves and binders

published to complement existing titles, as in the case of the *Nelson's Perpetual Loose-Leaf Encyclopaedia*. A very small proportion of printed encyclopaedias (0.04 percent) came as archival materials, particularly in the forms of manuscripts, research materials, or draft publications. A typical example is the case of manuscripts pertaining to the Arctic studies which were edited in 16 volumes in 1947 under the title *The Encyclopedia Arctica*. Another example is the *Ovideo Encyclopaedia* which is composed of 21 boxes of book manuscripts submitted for publication to the University of Arizona Press. Even private papers and correspondences were sometimes considered of encyclopaedic value. For instance, various notes by Michael B. Bever³⁵ while he was a student at MIT and Harvard were compiled in 1940 to be included as part of the *Encyclopedia of Materials Science and Engineering*. Similarly, correspondence, manuscripts, books and articles belonging to Murray Olderman³⁶ were compiled in 1947 for the *Nelson's 20th Century Encyclopaedia of Baseball*.

Computer files: Some encyclopaedias were also released as computer files, as seen in 1.68 percent of the library records. Among the earliest examples within my sample was a 4 $\frac{3}{4}$ in. disk published in 1974 which had an excerpt on art and music from the *American Concise Encyclopaedia* as well as a 5 $\frac{1}{4}$ in. disk with content from *The Discovery Encyclopaedia Starter Set* published in 1983. Additionally, there were various encyclopaedias originally published in print in the first part of the 20th century which were later digitalised and stored in floppy disks, CDs and DVDs.

Online materials: These represented 10.27 percent of the library records from my sample. Most of the time, these encyclopaedias were originally published in printed format but were subsequently digitalised and released on the Internet. There were also encyclopaedias published simultaneously in both printed and online format and a few of them which were solely published online.

Support materials: The Worldcat database also listed materials in other format such as visuals (0.92 percent of my sample), sound recordings (0.33 percent),

³⁵ Michael B. Bever was an outstanding metallurgist who pioneered the application of thermodynamics to the mechanical properties of metals. He was one of the first practitioners of the emerging field of materials science and engineering.

³⁶ Murray Olderman is a famous sportswriter and cartoonist. He was inducted into the US National Sportscasters and Sportswriters Association Hall of Fame in 1993.

maps (0.20 percent) and music scores (0.18 percent). These materials typically complemented existing printed encyclopaedias and often came from Encyclopaedia Britannica Inc. Under the category 'Sound recordings', the WorldCat database listed various cassette tapes, vinyl discs, or compact discs. The content of these recordings were typically pertaining to music and dance. Although audio books had grown steadily since the 1980s (Shokoff 2001), it was surprising to note that my sample only had one such example: the *Zolar's Encyclopaedia and Dictionary of Dreams* which are cassette tapes developed in 1989 by the Royal Victorian Institute for the Blind. Other encyclopaedia content were categorised as 'visuals' and were captured using a diversity of devices. The visuals released in the first half of the 20th century were mostly artwork reproductions, pictures, projected images, or slides: for example the *Historical Reconstructions of Ancient Greece*, the *Encyclopaedia Britannica Presidential Series*, the *Oxford Children's Encyclopaedia of Science* or the *Gale Encyclopaedia of Associations*. The visuals released since the 1970s were also in the form of filmstrips, films, videocassettes, videodiscs or VHS tapes. In terms of content, until recently, the visuals published usually contained short materials covering narrow topics such as the series of films on *Photosynthesis* produced between 1972 and 1974. With time, the content gradually becomes richer such as the *Anthology of World Music and Dance* or the *Joubert and Gardener's Encyclopaedia of Animals*. Many of these longer visuals were originally TV programmes which were subsequently converted and released in the form of DVDs; for example, *The Story of Oil* from TV Ontario or the *David Attenborough's Life on Land* from the BBC.

3.2.b. Year of publication

Printed materials: The distribution of printed encyclopaedias within the library catalogues based on the year of publication fluctuated a lot over the years. Considering the fact that printed encyclopaedias dominated my sample, the trends regarding the year of publication of all encyclopaedias within the WorldCat database –as discussed in Section 2.1 on p.141 and as illustrated in Figure 14 on p.142– are valid for printed encyclopaedias.

In-depth descriptions of the printed encyclopaedias –their origin and their topic coverage– are provided in Section 2.2.c on p.149 and in Section 2.2.d on p.153 respectively.

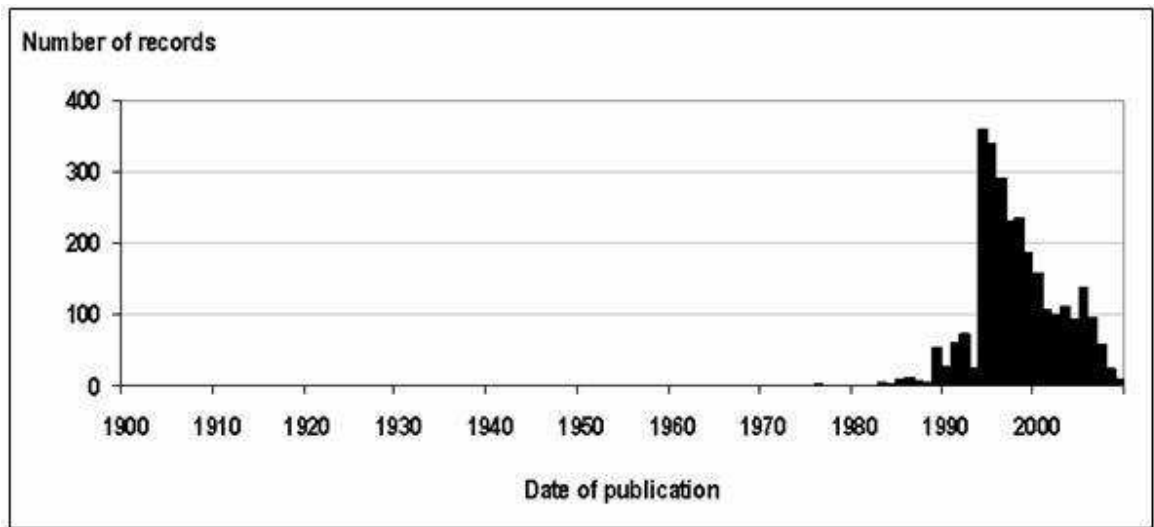


Figure created from 2,953 library records with "encyclopaedia" or "encyclopedia" in the title (WorldCat, 31st August 2010)

Figure 16. Encyclopaedic content available as computer files and listed in library catalogues

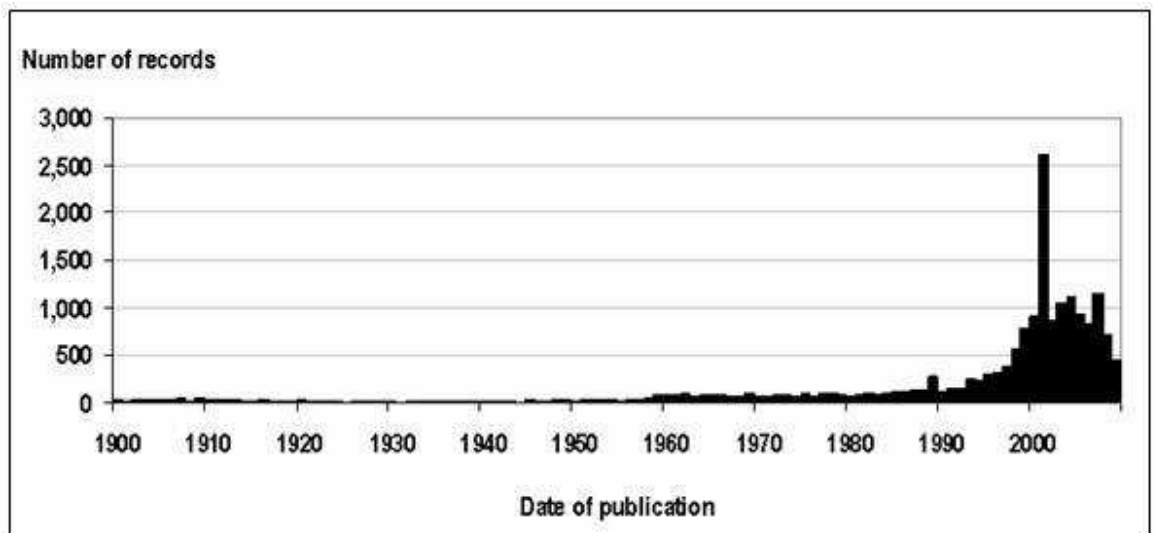


Figure created from 18,092 library records with "encyclopaedia" or "encyclopedia" in the title (WorldCat, 31st August 2010)

Figure 17. Encyclopaedic content available online and listed in library catalogues

Computer files: Looking at the distribution of computer files based on the year of publication, the recent ones definitely outnumbered those released before the 1990s (Figure 16). The years with the highest number of computer files were 1995 and 1996, with as many as 359 and 340 computer files respectively. Fewer computer files were published in other years. On the one hand, there were less than ten computer files for each of the years in the 1980s –which probably corresponds to the time when publishers started considering computer files as additional format for their encyclopaedias. On the other hand, there were still a relatively high number of online encyclopaedias published after the mid-1990s but their number is decreasing over time –probably as a result of the wider use of online materials, as opposed to the simpler electronic ones.

Online materials: Some of the encyclopaedias originally published in printed format –some as early as the years 1900s– were recently digitalised and made available online (Figure 17). Such encyclopaedias, however, were still rare and the number of resources published before the 1990s and released online remained relatively low. By contrast, the number of online encyclopaedias published since the mid- and late-1990s seems to increase significantly over time, despite some fluctuations between the years. The year 2001 stood out with a very high number of online encyclopaedias published (n=2,619 library records). Online encyclopaedias published since the 21st century were also well represented in library catalogues, although their number seemed to be decreasing over time.

Support materials: Throughout the years, the number of support materials also fluctuated (Figure 18). The WorldCat database did not list more materials as reproduction and recording technologies evolves over time. It is likely that maps, sound recordings, videos, etc. were less and less released as separate items and were instead incorporated into larger materials such as electronic and online encyclopaedias.

a) Visuals

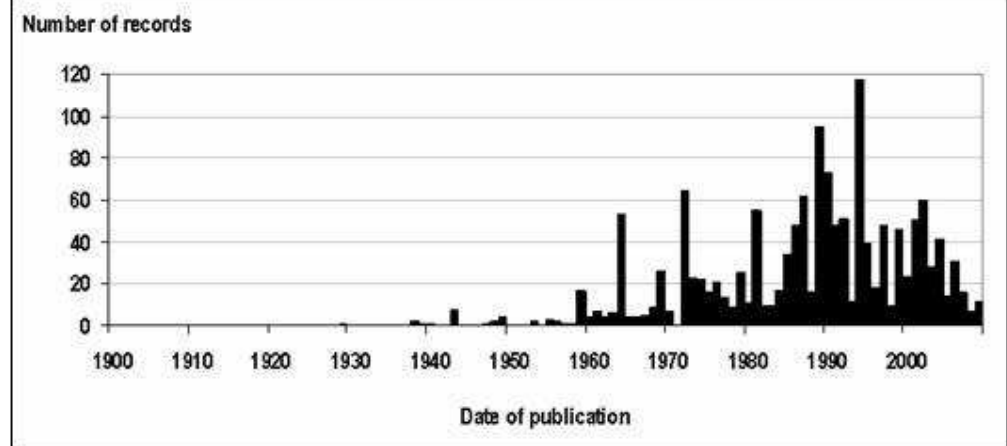


Figure created from 1,615 library records with "encyclopaedia" or "encyclopedia" in the title

b) Sound recordings

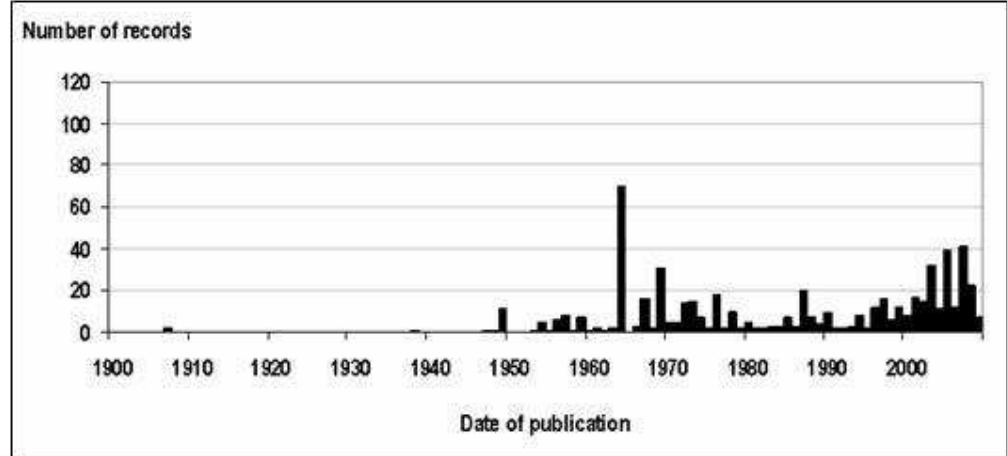


Figure created from 579 library records with "encyclopaedia" or "encyclopedia" in the title

c) Maps

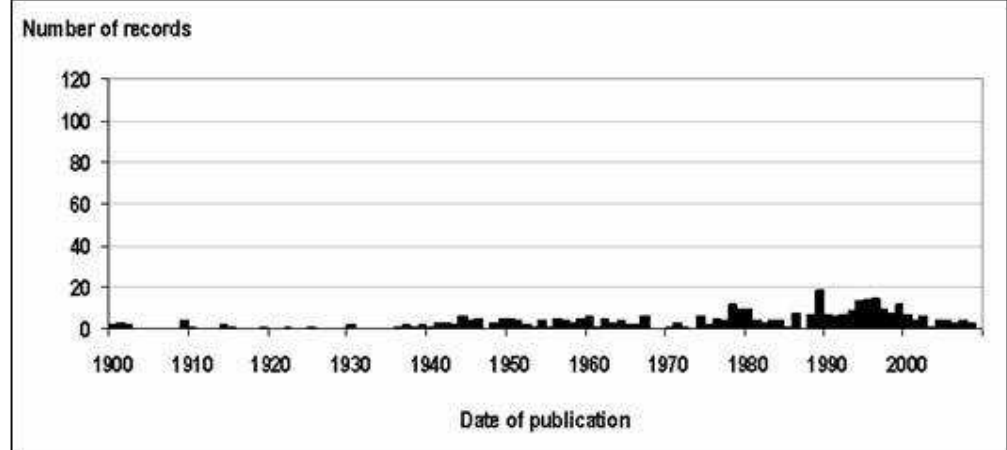


Figure created from 358 library records with "encyclopaedia" or "encyclopedia" in the title
(WorldCat, 31st August 2010)

Figure 18. Encyclopaedic content available as support materials and listed in library catalogues

In order to conduct a detailed analysis of the printed encyclopaedias, the next couple of sections of the chapter focus on a sample of 4,387 library records corresponding to 1,230 unique encyclopaedia titles in printed format (Information on the process of selecting the sample is provided in Chapter 3, Section 3.1.b on p.71). Although this second sample of 4,387 records only forms three percent of the original 176,211 records in my original sample, I would argue that the sample is representative. In particular, the pattern of distribution by year of publication in the first sample (Figure 14 on p.142) is also reflected in the second sample (Figure 19).

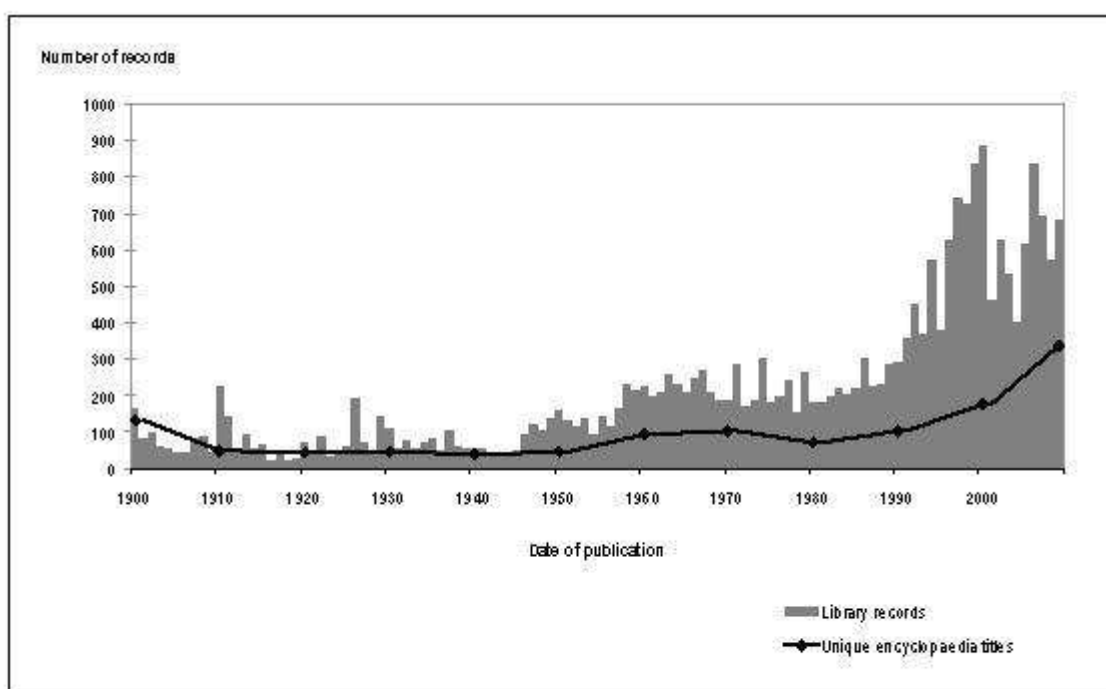
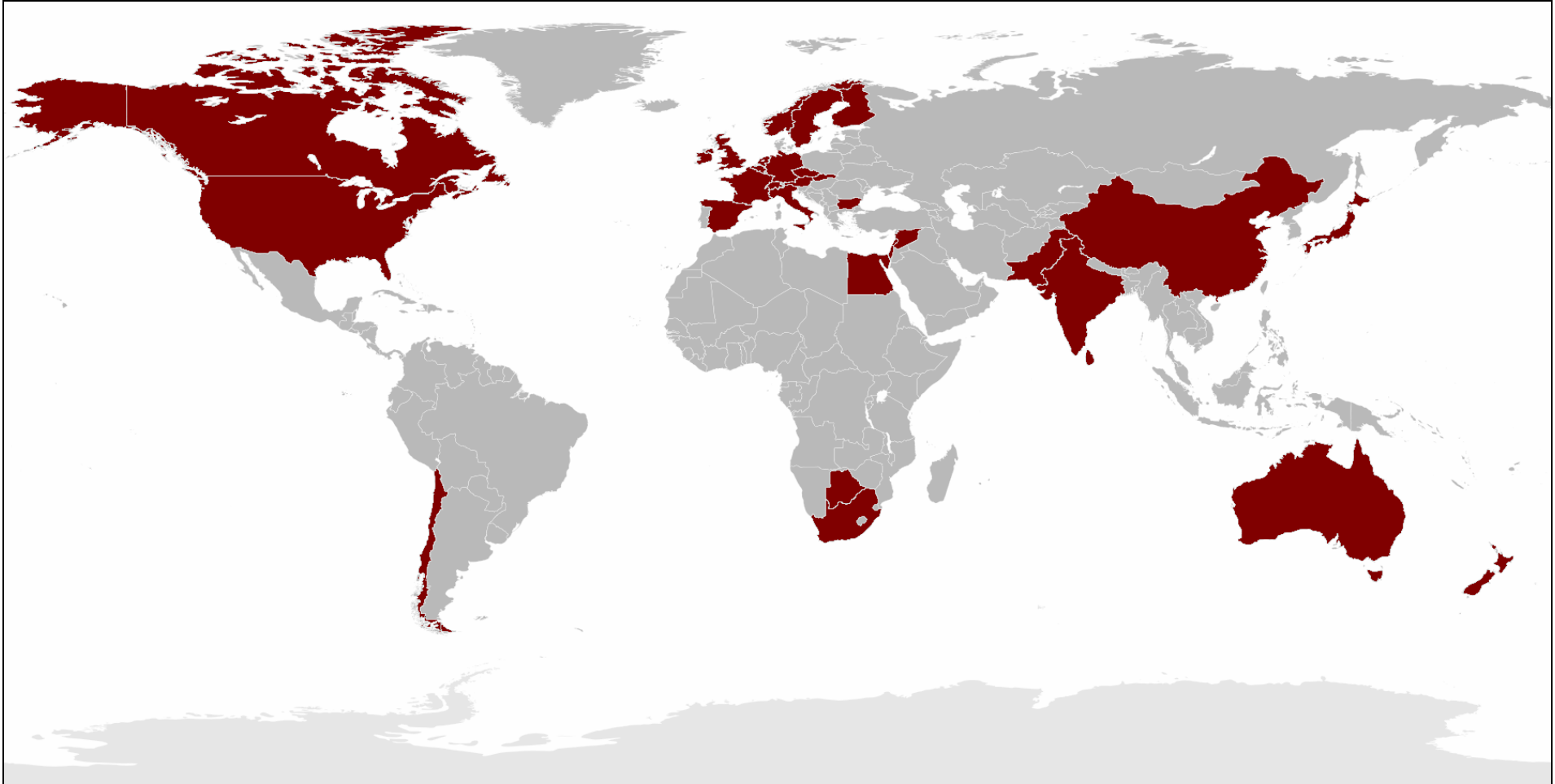


Figure created from 4,387 library records in printed format and with "encyclopaedia" in the title (WorldCat, 31st August 2010)

Figure 19. Comparison between library records and unique titles listed in library catalogues

3.2.c. Country of publication and publisher

The 1,230 printed encyclopaedias from my second sample came from 26 countries (See Map 1).



Map was created from 1,230 unique encyclopaedia titles (WorldCat, 31st August 2010)
In brown are countries where the encyclopaedias were published.

Map 1. Origin of English language encyclopaedias printed since 1900

The UK and the USA were among the most productive countries, which is not surprising considering the fact that these are the countries where the English language encyclopaedia making originated. More precisely, 427 titles from my sample were published in the UK, 287 titles in the USA and 100 titles simultaneously in both countries. Among the UK- and US-based publishers, Encyclopaedia Britannica Inc. was at the top of the list with 82 titles, followed by Butterworth (n= 41 titles), Odhams Press (n=15 titles), Routledge (n=10 titles), Macmillan (n=10 titles), Faber & Faber (n=9 titles), Waverley Book Co. (n=9 titles), Blackwell (n=8 titles). Other publishers had fewer than five titles from my sample. India was the other highly productive country, with as many as 416 titles. In fact, having published 216 out of the 1,230 encyclopaedias from my sample, Anmol Publications from New Dehli ranked first among the encyclopaedia publishers considered in my study. Other Indian publishers were less active than Anmol, yet many of them still produced more encyclopaedias than the majority of the UK- and US-based publishers. Examples of Indian publishers were: Cosmo Publications (n=24 titles), Crescent Publication Corporation (n=13 titles), Dominant Publishers (n=10 titles), Sarup & Sons (n=12 titles), and Campus Book International (n=6 titles) to name but a few. Other commonwealth countries which published English language encyclopaedias were: Australia (n=29 titles), Canada (n=14 titles), South Africa (n=13 titles), New Zealand (n=7 titles), and Botswana, Pakistan, Sri Lanka, Singapore (n= 1 title each). In Europe, The Netherlands were the most productive (n=25 titles), followed by Germany (n=9 titles), France and Switzerland (n=8 titles each), Spain (n=2 titles), and finally the ex-Czechoslovakia, Austria, Bulgaria, Finland and Sweden (n=1 title each). A few encyclopaedia titles were also published in non-Anglophone countries outside Europe; particularly Japan, China, Chile, Lebanon, and Israel.

Finally, the number of encyclopaedias published every year evolved in a relatively similar pattern in the UK and the USA (Figure 20). In particular, after the recovery of their encyclopaedia publishing industry in the 1950s, there seemed to be a slight downtrend in the 1970s and 1980s. But a worse decrease occurred in recent years. In fact, in 2009, the number of English language encyclopaedia titles published in the UK was only 39 and only 16 in the USA. Similar patterns were observed in the production of English language

encyclopaedias in the other countries, except that these countries published far fewer encyclopaedias every year than the UK or the USA.

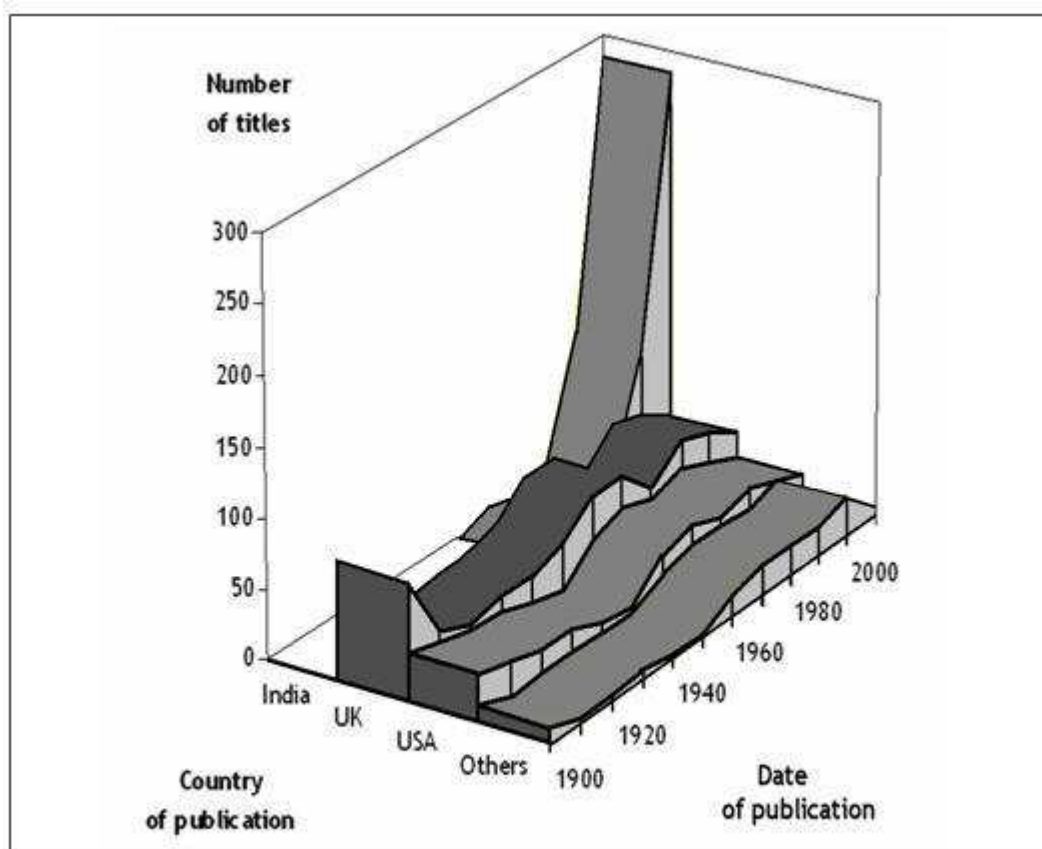


Figure created from 1,230 unique encyclopaedia titles (WorldCat, 31st August 2010)

Figure 20. Origin of English language encyclopaedias printed since 1900

By comparison, India appears as an exception with its recent domination of encyclopaedia publishing. The WorldCat database indicates that, before 1980, India had hardly published any English language encyclopaedia, and the few times it did, the number never exceeded five titles a year. Then, as many as 15 titles published in 1990 from my sample came from that country. This number reached 97 in 2000 and 286 in 2009³⁷. The majority of these encyclopaedias were developed by Indian authors and published by Indian publishers. Only a minority of the encyclopaedias were developed in other countries and had imprints in India. Numerous factors could explain the new trends in the Indian publishing; for example: the cultural awakening of the Indian society and the increased

³⁷ This sudden increase in the Indian encyclopaedia publishing was also observed in the Nielsen Bookdata, a database built not on library catalogues, rather on lists of publications provided by publishing companies from all over the world (Appendix).

democratisation of knowledge (Kesavan 1984, 1988, Mohanrajan 1990), the ever-growing demand for non-fiction books and textbooks in the English language (Altbach 1975), the influence of various social and political factors (Butalia 1993), as well as the desire of modern Indian publishers to also get their share of the large market offered by books in the English language (Tadie 2002).

3.2.d. Topic coverage

Only 14.7 percent of the titles in my sample were generic encyclopaedias (Figure 21), most of which published in the UK and the USA. By contrast, out of the 416 titles published in India, only the *Encyclopaedia of Human Knowledge* published by Caxton in 1990 and the *Encyclopaedia Mundarica* by Gian Publishing House in 1930 were generic encyclopaedias. As many as 85.3 percent of my sample were specialized encyclopaedias; of which 7.15 percent were dedicated to science and 13.01 percent to technology; both inferior to the number of titles dedicated to social sciences which forms the most important category of specialised encyclopaedias with 26.59 percent of my sample. The titles dedicated to history, geography and biography were also relatively important as they represented 10.33 percent of my sample. Comparatively, the titles dedicated to religion, philosophy and psychology, literature, computer and information science, and language were the least represented. Considering that the rest of the thesis focuses particularly on science and technology encyclopaedias, these are further described below.

Within the Dewey Decimal Category, the “Science category” gathers works focusing on pure sciences such as mathematics, physics and chemistry, astronomy and earth sciences, natural and life sciences. Almost a quarter of the science encyclopaedias from my sample (21 out of 88 titles) were dedicated to mathematics, which dominated the science encyclopaedia publishing starting in 1970 and which became even more pronounced in the years 1990 and 2000. The number of chemistry encyclopaedias was also relatively high in 1940. The topics of astronomy and zoology were the best represented after mathematics and chemistry. Comparatively, the other branches of science received less coverage from the specialised encyclopaedias published in the 20th century.

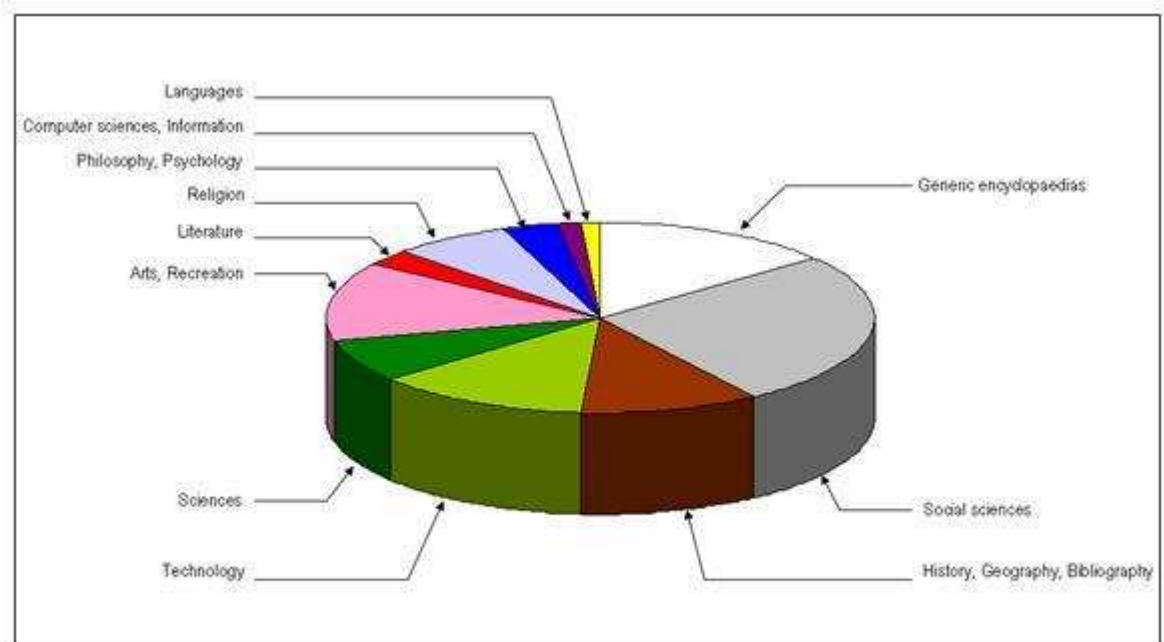


Figure created from 1,230 unique encyclopaedia titles
(Worldcat, 31st August 2010)

Figure 21. Topic coverage of English language encyclopaedias printed since 1900

The “Technology category” gathers works focusing on both technologies and applied sciences such as agriculture, manufacturing, engineering, building, and medical sciences. Within my sample, these fields were roughly equally represented: the number of titles dedicated to health-related and medical fields was only slightly superior to the number dedicated to others fields. Generally speaking, the technology encyclopaedias were dedicated to the industries dominant at the time of publication; for example, rubber, ceramic, mechanics and textile in the early decades of the 20th century, military technology such as firearms, aircraft and bombers during the wars, and building and plastic industry in the years 1960 and 1970. Encyclopaedias on household issues and farming were also very common, particularly before the 1940s and after the 1970s. Encyclopaedias dedicated to medicine started to flourish during the wars, reflecting the great advances in the field during that time. After the wars, medical encyclopaedias continued to be published but they focused on other areas of specialities such as diet and nutrition, mental health, natural medicine, sports medicine, or geriatric care.

With the exception of generic encyclopaedias and encyclopaedias dedicated to social science, the number of encyclopaedias from most categories evolved in a relatively similar fashion since 1900 (Figure 22). Most categories –including

Science and Technology encyclopaedias— reflected the annual fluctuations described in Section 1.2.b; namely a decrease around the Second World War, a recovery in the 1950-1970, a slowdown around 1980 and some improvements after that. Regarding generic encyclopaedias, the annual fluctuations were much more pronounced than those observed in specialised encyclopaedias. Then, after the important drop in 1980, the number of generic encyclopaedias published every year failed to recover.

This was the total opposite to the case of social science encyclopaedias which have displayed an almost exponential growth since 1980, probably as a result of an increased diversification of the field in recent years (Gareau 1987, Gulbenkian Commission on the Restructuring of the Social Sciences 1996).

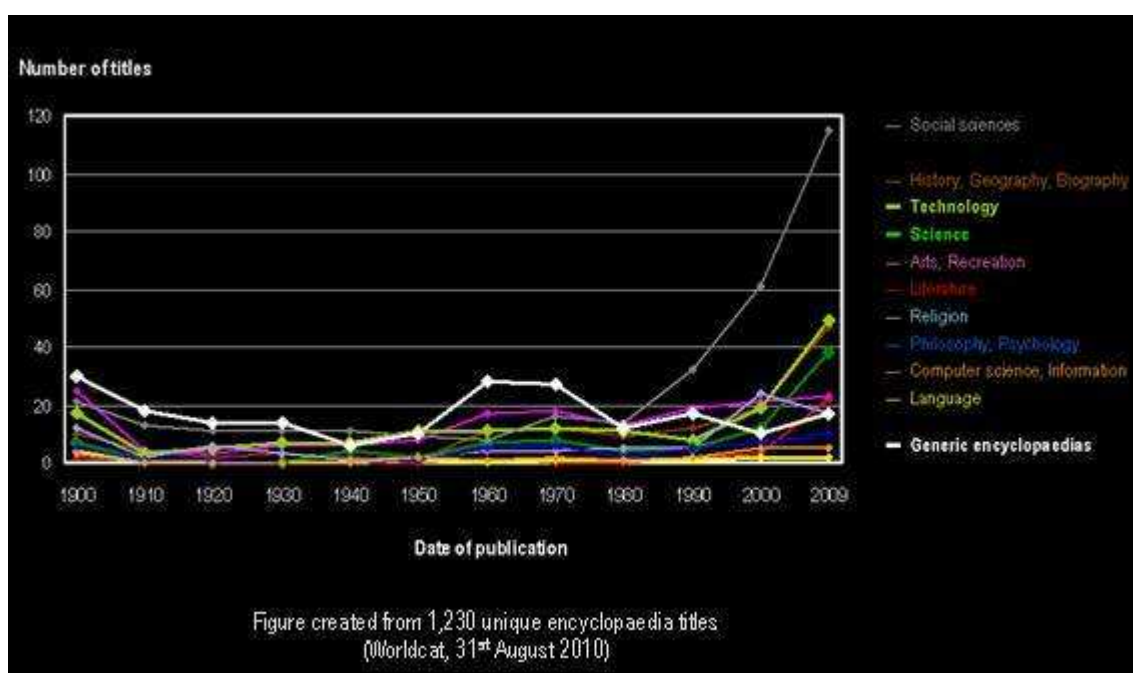


Figure 22. Topic coverage for English language encyclopaedias printed since 1900

4. English language encyclopaedias: Predictions for the rest of 21st century

The chapter indicates that, at a ratio of three out of one thousand, English language encyclopaedias represent a relatively small fraction of library collections. Throughout the 20th century and early 21st century, this ratio seems constant, which suggest that encyclopaedias occupy a small but well established niche in libraries. It is therefore reasonable to assume that they will continue to occupy the same niche within the 21st century, or at least in the short-term

future. Against the concerns expressed in Section 1.1 on p.134 regarding the future of printed encyclopaedias, the current chapter indicates that the format still largely dominated the industry throughout the 20th century. It is true that the number of encyclopaedias in electronic and online format has been growing, yet they are still ten times less important than the number of encyclopaedias in printed format. Electronic and online encyclopaedias do not cause real concerns for the printed ones, at least in the immediate future. In fact, it is difficult to predict the extent to which the niche occupied by encyclopaedias, particularly the printed ones, will remain the same in future publishing industry.

There are three other noteworthy trends observed in the current chapter.

- The first trend is pertaining to the change in the activities of encyclopaedia publishers from various parts of the world. Historically, the UK and the USA have been the leaders in the development of English language encyclopaedias. The number of encyclopaedias published in these two countries, however, seems to have been declining since the end of the 20th century. By contrast, Indian publishers have shown a great increase in their activities. They are now surpassing the rest of the world in the number of encyclopaedia titles in the English language released every year. Recently, this number seems to be following an uncharacteristic exponential rate to the extent that it is hard to predict the size of the industry even in the next couple of decades.
- The second trend is pertaining to the ratio between generic and specialised encyclopaedias. Generic encyclopaedias had prevailed in the early history of encyclopaedia making as described in Chapter 4 but the preference had clearly shifted in favour of specialised encyclopaedias since the 20th century. In fact, it seems probable that, in the 21st century, the ratio of the generic encyclopaedias will be around the order of ten percent as it was throughout the 20th century –or even less.
- Finally, regarding the social sciences encyclopaedias, their number has been soaring in the last few years compared to any other specialised encyclopaedias. This rate of increase, however, seems too high to be sustained for a long period of time in the future. The data used during the analysis does not allow more precise predictions.

The next chapter follows up on these findings and investigates the level of dissemination of the encyclopaedias published so far in the 21st century within libraries throughout the world.

CHAPTER 7.

ENCYCLOPAEDIA DISSEMINATION

Now that it is clear there are still many encyclopaedias available in the 21st century, the next step is to assess their authority as indicated by their respective level of dissemination. Indeed, it is indicated in Chapter 1 that the extent of the authority of a published text is measured in terms of the number of people who considered this particular text as authoritative.³⁸ In this study of encyclopaedia authority, it was not possible to survey encyclopaedia users;³⁹ therefore, the library holding of 21st century encyclopaedias was considered instead. Although Chapter 6 indicates that social science encyclopaedias seem to have the most promising future, I chose to look at the next best alternative –the science and technology encyclopaedias– because of my educational background. Details of the methodology are provided in Chapter 3.⁴⁰

In brief, the current chapter investigates how many libraries hold copies of the science and technology encyclopaedias published between the years 2000 and 2009. As in the previous chapter, the WorldCat database was used to capture a snapshot of the dissemination of these science and technology encyclopaedias within institutions which are members of the Online Computer Library Center (OCLC) throughout the world. The current chapter starts with a brief description of the OCLC institutions and the science and technology encyclopaedias under study before analysing the dissemination pattern of these encyclopaedias. The chapter also provides additional analysis regarding the dissemination patterns of the most popular titles in an attempt to identify factors which may have

³⁸ See Chapter 1, Section 4.1.b on p.34

³⁹ See Chapter 3, Section 1.1 on p.63

⁴⁰ See Chapter 3, Section 3.2 on p.74

increased the probability of these latter reaching more people and becoming more authoritative than other encyclopaedias.

1. Introduction to the study

1.1. OCLC institutions and their library catalogues

As explained in the *Methodology Chapter*⁴¹, the WorldCat database is a network of library content that is run by the Online Computer Library Center (OCLC) which has over 72,000 member institutions in over 170 countries and territories.⁴² A cursory look through the OCLC website indicates that the great majority of these institutions are university libraries. There are also public ones such as national libraries, or state libraries and governmental ones. The British Library, the US Library of Congress, the National Library of China, and the Bibliothèque Nationale de France are some of the well-known examples. A handful of corporate/business institutions (for example ALIBRI in the USA) as well as a few encyclopaedia vendors and distributors (for example D.K. Agencies in India or Cobiss.SI-IZMU in Slovenia) are also members of OCLC and have their catalogues included within the WorldCat database.

1.2. Science and technology encyclopaedias in library catalogues

From the 176,211 library records from the WorldCat database considered in the previous chapter, only 1,342 were published between 2000 and 2009 and fell within the Science and Technology Categories. These 1,342 library records corresponded to 396 unique titles, however, only 392 titles are considered for analysis here because of incomplete data in four instances.

All 392 encyclopaedias were originally published in print, although alternative formats were also sometimes available. As many as 339 titles (86.47 percent) were released solely as books; the rest were also published as computer files (1.15 percent), as online resources (2.03 percent), or in a combination of various formats (9.95 percent).

⁴¹ See Chapter 3, Section 3.1.b on p.71

⁴² See <http://www.oclc.org/worldcat/statistics/default.htm>

These 392 science and technology encyclopaedias originated from 135 publishers (with an average of 3.15 titles per publisher) in 16 countries (Map 2 on p.163). Following up the trends observed since the late 20th century, there was a domination in the number of titles published in India in the 21st century. As many as 307 titles (77.53 percent of my sample) were published in that country alone. Indian publishers seemed to have a strong preference for the printed format: only a very small fraction of the Indian titles are available as computer files or as online resources (4.5 percent). Also, the next most productive countries after India were the UK and the USA. It should be noted, however, that some of the UK- and US-based publishers were also active in other countries through their overseas branches or through co-publishing arrangements with other firms (particularly in The Netherlands, Germany, Ireland, Australia or China) but a detailed analysis of the British and American Publishers on other countries is beyond the scope of this thesis.

Out of the 392 titles, there were 203 science and 185 technology encyclopaedias. The numbers of titles published annually in both Science and Technology Categories showed comparable fluctuations over time (Figure 23). In particular, after a downturn during the years 2004 and 2005, the industry seemed to recover. The importance allocated to the various topics in the field of technology did not change much during the first decade of the 21st century whereas the diversity of science encyclopaedias published was definitely greater than that of the encyclopaedias published in the 20th century. “Hard” sciences such as mathematics and chemistry had relatively low coverage. The past interest in astronomy encyclopaedias also dramatically dropped –only two titles from my sample were published on that topic in ten years. But these changes gave more space for encyclopaedias on other topics, particularly on those related to life science, zoology, botany and earth science (Figure 24).

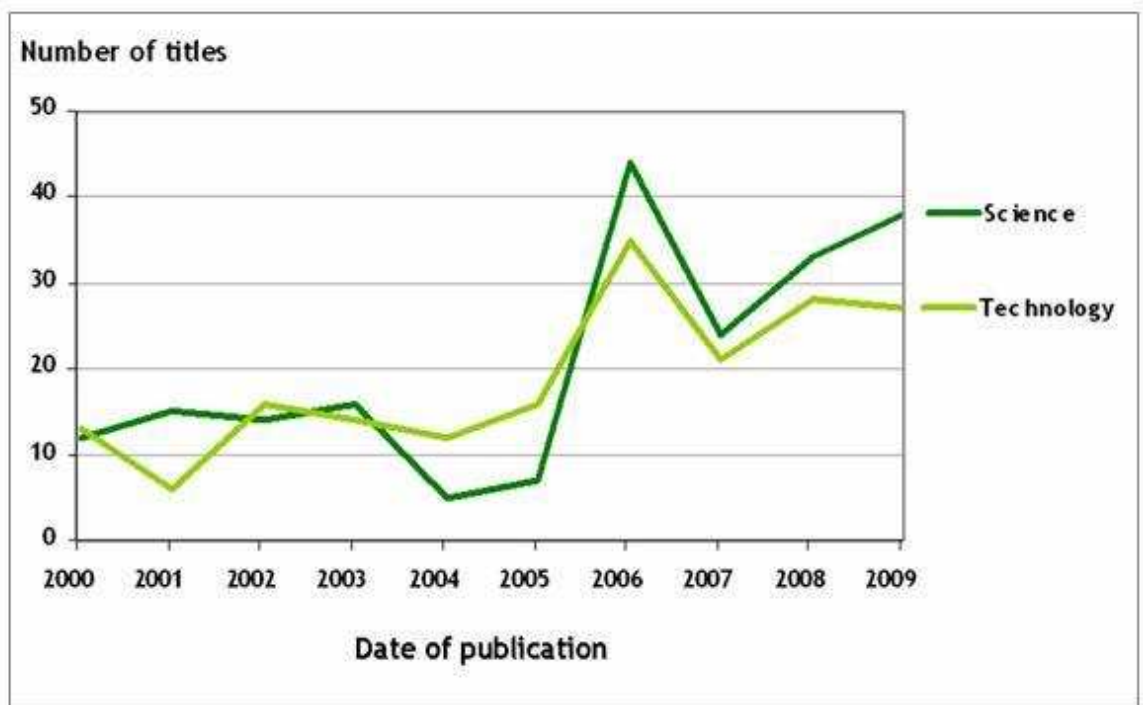


Figure created from 1,230 unique encyclopaedia titles (WorldCat, 31st August 2010)

Figure 23. Science and technology encyclopaedias published since 2000

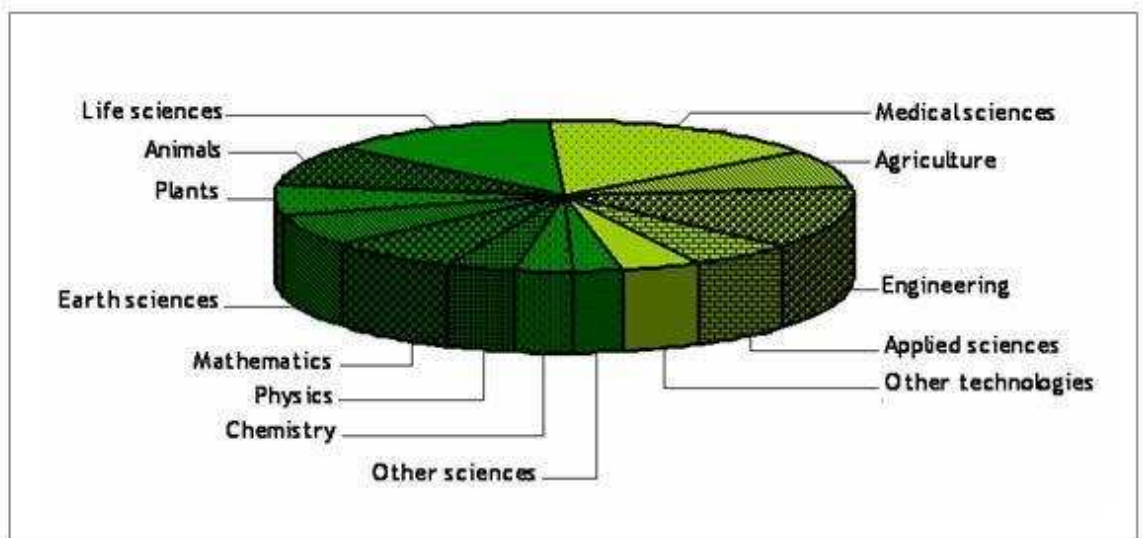


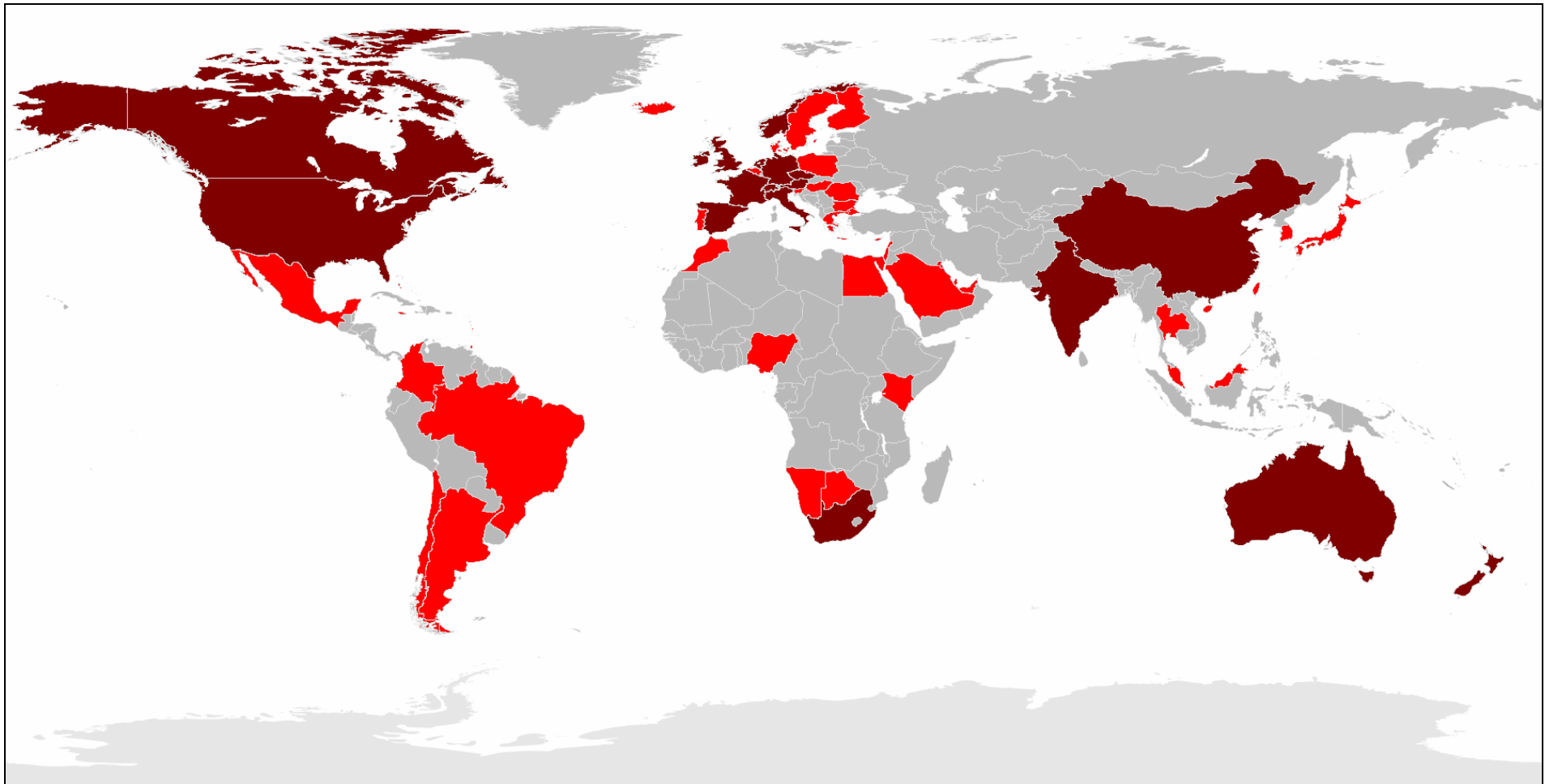
Figure created from 1,230 unique encyclopaedia titles (WorldCat, 31st August 2010)

Figure 24. Topic coverage of science and technology encyclopaedias published since 2000

2. Science and technology encyclopaedias: Dissemination pattern in general

As of March 2011, 5,429 OCLC institutions were holding copies of science and technology encyclopaedias written in the English language. These institutions were unevenly distributed across 59 countries (Map 2 on p.163). As many as 4,187 institutions were located in the USA alone. The other countries with a high number of OCLC institutions were relatively wealthy and were often –but not always– Anglophone countries: the UK (n=195 institutions), Australia (n=230 institutions), Canada (n=151 institutions), France (n=111 institutions), New Zealand (n=93 institutions), or Germany (n=88 institutions). On the other hand, 43 out of the 59 countries only had ten or fewer OCLC institutions with science and technology encyclopaedias titles. Some of the countries where English is widely spoken and where science and technology encyclopaedias could be disseminated are actually poorly represented. In particular, my dataset only had 14 OCLC institutions based in India, whereas, even by the early 1990s, the country had hundreds of university-level institutions, in addition to many other technical and vocational colleges.⁴³

⁴³ See for instance Thakur A.P. and Pandey S. (2009) *21st Century India: View and vision*. New Delhi: Global Vision Publishing House.



Map created from 392 science and technology encyclopaedias (WorldCat, March 2011)
In red are countries where the encyclopaedias were disseminated
In brown are countries where the encyclopaedias were both published and disseminated.

Map 2. Dissemination of science and technology encyclopaedias published since 2000

2.1. Dissemination in individual OCLC institutions

The OCLC institutions differed widely when it came to the number of science and technology encyclopaedias listed in their catalogues, ranging from one to 269 titles per institution. In fact, 2,114 out of the 5,429 institutions only hold one science or technology encyclopaedia and up to 5,293 institutions had fewer than 15 encyclopaedias.

Among the 136 institutions which had 15 or more science and technology encyclopaedias, the number of encyclopaedias held seemed to depend on the type of institution (Table 5). Vendors, corporate businesses and network distributors, followed by Federal, National, and State libraries –particularly those in the US, the UK, Australia and Canada– hold the highest number of encyclopaedias. Within learning institutions, universities had more encyclopaedias than colleges.

Table 5. Number of science and technology encyclopaedias per type of institution

Type (number) of OCLC institution	Number of science/technology encyclopaedias		
	Minimum	Average	Maximum
Vendor (n=5)	18	89.00	269
Corporate/Business (n=3)	15	77.33	198
Network/Distributor (n=2)	21	26.00	31
Federal/National Government (n=4)	18	33.25	47
State/National Library (n=9)	16	25.33	56
Public Library (n=11)	15	20.55	33
Universities (n=99)	15	21.49	57
Vocational, technical, community colleges (n=2)	15	15.50	16
Other (n=1)	16	16.00	16
Total (n=136)	15	25.67	269

Table created from 136 OCLC institutions with 15 or more science and technology encyclopaedias (WorldCat, March 2011)

2.2. Dissemination in all OCLC institutions

In general, there was a strong correlation between the number of institutions and the number of countries of dissemination ($r=0.8097$), i.e. the higher the number of institutions reached, the greater the number of countries.

On average, the science and technology encyclopaedias from my sample were found in 51.90 institutions and 4.36 countries. These numbers were, however, very skewed since the majority of the encyclopaedias were held in a relatively limited number of locations (Figure 25). More precisely, 74 out of the 396 titles (18.69 percent of my sample) did not cross the boundaries of the countries where they were published. Another 289 titles (72.98 percent) reached two to nine countries. Only the remaining 33 titles (8.33 percent) managed to reach ten or more countries –with the most widespread title reached 34 countries. Likewise, the dissemination of science and technology encyclopaedias in various institutions was limited. Up to 55 titles (13.89 percent of my sample) were held in only one institution whereas as many as 262 titles (66.16 percent) were held between two and 10 institutions, 42 titles (10.61 percent) hold between 11 and 100 institutions, 33 titles (8.33 percent) between 101 and 1000 institutions. Only four titles (1.01 percent of my sample) reached more than 1000 institutions.

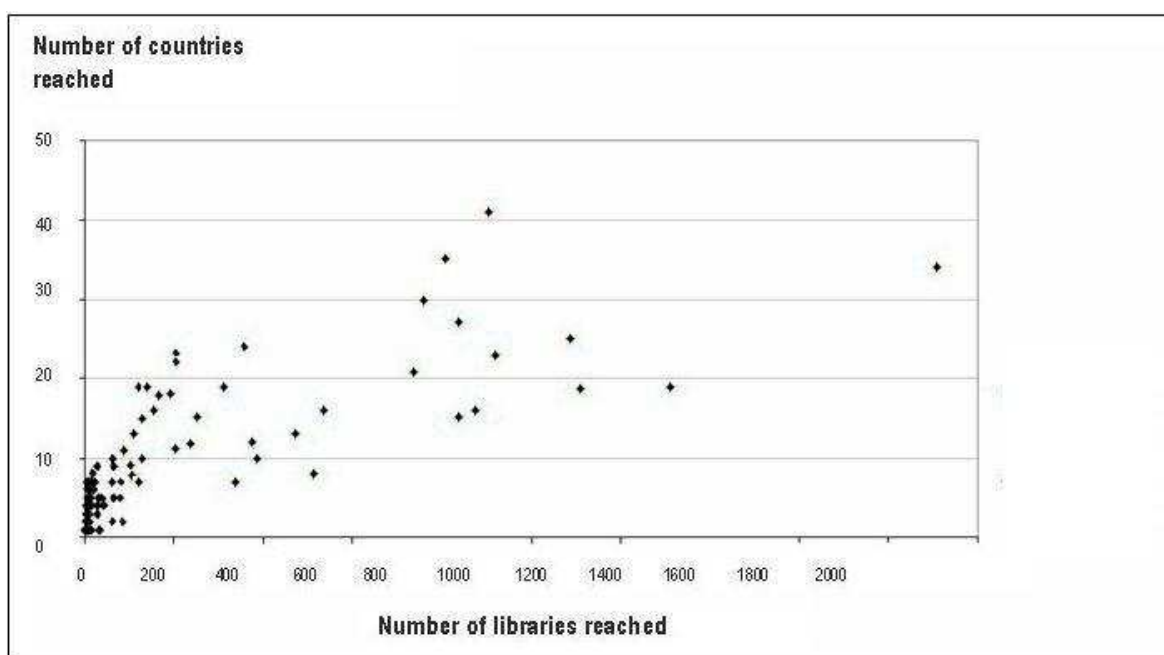


Figure created from 1,230 unique encyclopaedia titles (WorldCat, 31st August 2010)

Figure 25. Dissemination of science and technology encyclopaedias published since 2000

2.3. Factors influencing the level of dissemination

2.3.a. Format of publication

The diversity in the format of delivery seemed to increase the level of dissemination of science and technology encyclopaedias (Table 6). In particular, the encyclopaedias which were released online or in a combination of other formats were more widely disseminated than the ones delivered as books only. Printed encyclopaedias were probably avoided whenever possible because they were often more expensive than the alternative formats and because they required more space for storage. Moreover, an increasing number of encyclopaedias were made available from online databases such as the LexisNexis Library (lexisnexis.com) and from the websites of major publishers such as Springer (springerlink.com), Elsevier (sciencedirect.com), or Oxford University Press (oxfordreference.com).

Table 6. Dissemination of science and technology encyclopaedias per format of publication

Format of publication (number of encyclopaedias)	Average number of institutions reached	Average number of countries reached
Book only (n=339)	12.84	3.04
Book and Computer file only (n=6)	5.00	1.80
Book and Internet resource only (n=8)	185.50	11.50
Book, Computer file, Internet resource (n=39) (and other formats)	371.00	14.82

Table created from 392 science and technology encyclopaedias
(WorldCat, March 2011)

2.3.b. Year of publication

One may think that an encyclopaedia which was published several years ago would have a greater chance of reaching a high number of institutions than another encyclopaedia which was published only recently. After all, there is always a delay between the time when the title is released by the publisher and the time when sales picks up as it requires some time for the title to become known by potential buyers and users. My analysis, however, indicates that the year of publication had no major influence on the level of dissemination. In other words, the titles published in the early 2000s were not more common in OCLC institutions than the titles published in later years.

2.3.c. Country of publication and publisher

Science and technology encyclopaedias from the USA, the UK, Germany, the Netherlands and China were the most successful in reaching institutions from all over the world (Table 7). Comparatively, the level of dissemination of the science and technology encyclopaedias in English language published in the remaining 11 countries was much lower –in fact, encyclopaedias in latter cases reached less than 30 institutions and less than 10 countries.

Although Indian publishers produced a lot of science and technology encyclopaedias, these latter only reached on average 4.37 institutions and 2.94 countries. Only a few titles were better disseminated; the best examples were the *Encyclopaedia of Classical Indian Sciences* by Universities Press which reached 81 institutions and the *Encyclopaedia of Environmental Pollution and Awareness in the 21st Century* by Anmol Publications which reached nine countries.

Table 7. Dissemination of science and technology encyclopaedias per country of publication

Country of publication (number of encyclopaedias)	Average number of institutions reached	Average number of countries reached
USA (n=39)	453.79	15.92
UK (n=46)	199.28	9.52
The Netherlands (n=4)	256.50	16.75
Germany (n=6)	189.00	11.83
China (n=2)	61.00	10.50
Spain (n=2)	34.50	3.50
France (n=2)	25.50	5.00
Australia (n=5)	19.00	2.20
Italy (n=2)	14.50	2.50
Canada (n=1)	12.00	3.00
Ireland (n=1)	12.00	3.00
Norway (n=1)	10.00	5.00
South Africa (n=1)	9.00	1.00
Czech Republic (n=1)	7.00	3.00
India (n=307)	4.37	2.94
Switzerland (n=1)	3.00	1.00

Table created from 392 science and technology encyclopaedias some of which were published in several countries simultaneously (WorldCat, March 2011)

It is possible that, in a few cases, the publisher's name had a positive impact on the level of dissemination of science and technology encyclopaedias. For example, all encyclopaedias published by some of the well-known publishers such as Springer, Wiley, Elsevier, SAGE, Academic Press, Blackwell, Oxford University Press, or Churchill Livingston exceeded the average number of institutions and countries reached by the encyclopaedias within my sample. However, one can hardly state with certainty that publishing with a well-known publisher automatically ensures widespread dissemination. Indeed, none of the publishers listed above had more than five titles within my sample, so generalisation is impossible. Also, there were other well-known publishers which were inconsistent in ensuring the success of all their encyclopaedias. For example, that was the case of Encyclopaedia Britannica Inc. whose *Britannica Guide to Climate Change* reached 237 institutions in 12 countries whereas its *Britannica Presents the Wonderful Language of Nature* was only found in the library catalogue of one institution. Similarly, in the case of Taylor & Francis, the *Encyclopedia of Environmental Science and Engineering* was found in 312 institutions in 19 countries whereas the *Encyclopaedia of Human Helminths* was, limited to one institution.

2.3.d. Topic coverage

Encyclopaedias on medicine seemed to be the most widespread –reaching on average 119.81 institutions and 5.89 countries– whereas encyclopaedias on agriculture and applied sciences were the least disseminated. No other tendencies however seemed to stand out from the data (Table 8). It can be concluded that the topic coverage does not seem to help predict the level of dissemination of science and technology encyclopaedias.

It is possible that other factors not discussed in the current chapter were influencing the level of dissemination of the science and technology encyclopaedias. It is also possible that various factors discussed in the current chapter interact simultaneously. So, the importance of each factor may change when considered with other factors. Even factors which are said to be insignificant from my simple analysis may in reality be determinant, and vice

versa. Further analysis may be needed to elucidate missing and interacting factors, but such analysis is beyond the scope of the thesis.

Table 8. Dissemination of science and technology encyclopaedias per topic coverage

Topic coverage (number of encyclopaedias)	Average number of institutions reached	Average number of countries reached
Science		
Life sciences (n=51)	32.94	3.27
Animals (n=36)	79.28	4.94
Plants (n=24)	32.92	3.71
Earth sciences (n=28)	53.11	5.50
Mathematics (n=28)	37.57	4.43
Physics (n=16)	53.38	4.63
Other sciences (n=11)	87.09	4.82
Technology		
Chemistry (n=13)	31.15	4.38
Medical sciences (n=62)	119.81	5.89
Agriculture (n=32)	9.34	3.03
Engineering (n=51)	37.18	4.14
Applied sciences (n=23)	3.78	2.57
Other technologies (n=17)	32.59	4.88

Table created from 392 science and technology encyclopaedias (WorldCat, March 2011)

3. Science and technology encyclopaedias: Dissemination pattern of the most popular titles

3.1. Dissemination in all OCLC institutions

A small group composed of 38 encyclopaedias (9.60 percent of my sample) stood out because of the great extent of their dissemination –as illustrated by the outliers on Figure 26. This group is labelled “popular encyclopaedias” in the rest of this chapter. The popular encyclopaedias were either present in more than 10 countries (n=30 titles) regardless of the number of institutions reached; or present in ten or less countries but still managed to more than 100 institutions (n=7 titles). Just for the sake of comparison, the remaining 355 less popular encyclopaedias only reached on average 6.45 institutions and 2.97 countries only. The remainder of the chapter tries to evaluate whether these popular

encyclopaedias had characteristics which automatically distinguished them from other encyclopaedias.

3.2. Factors influencing the level of dissemination

It is indicated in Section 2.4.b and Section 2.4.d of the current chapter that neither the year of publication nor the topic coverage seemed to influence the level of dissemination of the science and technology encyclopaedias. Unsurprisingly, the popular encyclopaedias were not published in a particular year, and did not all focus on any particular topic.

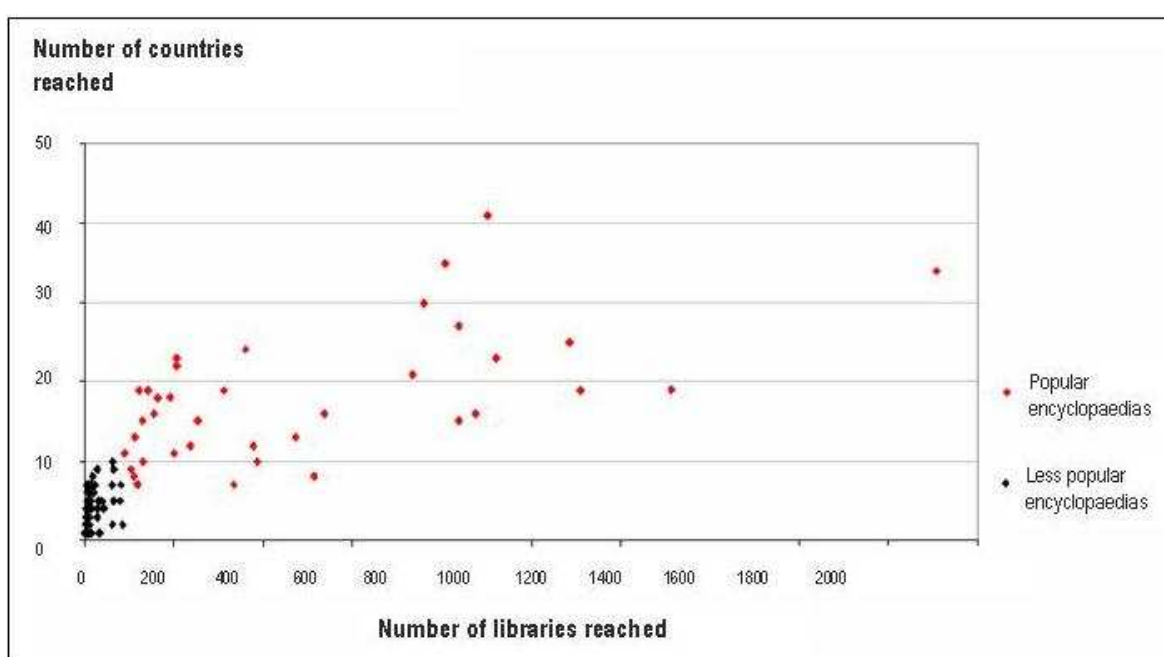


Figure created from 1,230 unique encyclopaedia titles (WorldCat, 31st August 2010)

Figure 26. Dissemination of popular and less popular science and technology encyclopaedias

Just to provide additional information on the topic coverage of popular encyclopaedias, on top of the list were four titles which were recorded in the bibliographic catalogue of more than 1,000 OCLC institutions:

- the *Encyclopaedia of Sports Medicine* published by Blackwell (available from 1,908 institutions in 34 countries),
- the *Encyclopaedia of Snakes* by Cassell Paperback (available from 1,314 institutions in 19 countries),
- the *Encyclopedia of Aging* by Springer (available from 1,111 institutions in 19 countries), and

- the *Encyclopedia of Animal Behaviour* by Greenwood Press (available from 1,086 institutions in 25 countries).

There seem to be little commonalities between these four titles. I can only speculate that their popularity lies in factors which are beyond the scope of this chapter. For example, it is possible that the content of these encyclopaedias is perceived to be of exceptional quality and the encyclopaedia editors of extraordinary reputation, but I have no way of knowing from looking at the information provided in the bibliographic records. More generally, a cursory analysis of the list of popular encyclopaedias shows there were titles focusing on traditional topics (e.g. on mathematics, on medicine such as anatomy, on biological sciences such as genetic and evolution) as well as titles focusing on the latest trends in science and technology (e.g. on climate change or on genomics). There were also titles of interest for a large number of reader because they were providing useful reference on international standards –for example the *Encyclopaedia of Scientific Units, Weights, and Measures*, or the *Encyclopaedia of International Corrosion Standards*– as well as titles for a narrower and more specialised readership –for example, the *Byzantine Encyclopaedia of Horse Medicine* or the *Encyclopaedia of Tidepools and Rocky Shores*.

Regarding the format of publication of the science and technology encyclopaedias, Section 2.4.a indicates that diversification in this area seemed to increase the level of dissemination among OCLC institutions. The diversification of the format of publication was, however, not exclusive to popular encyclopaedias. On the one hand, 11 of the less-popular encyclopaedias were published simultaneously as books, electronic materials, online resources, etc. On the other hand, 6 of the popular encyclopaedias were released in the printed format only. In other words, the diversification of the format was not enough to ensure that these encyclopaedias would end up in the popular group.

Regarding the origin of popular encyclopaedias, all 37 titles came from five countries: the USA, the UK, Germany, China and The Netherlands. Yet, the country of origin was not a distinguishing feature of the popular group. Indeed, publishers from these five countries also had numerous encyclopaedias which did

not make it to the popular group –6 titles from the USA, 26 from the UK, 4 from Germany and one each from China and The Netherlands.

Finally, it is suggested earlier in Section 2.3.c of this chapter that the publisher's name could have a positive impact on the level of dissemination of the encyclopaedias. It was, however, not possible from the analysis of the popular encyclopaedias to confirm or refute this suggestion. The 37 popular encyclopaedias were produced by 42 publishers, although 36 of these publishers only had one title within my sample, a fact which prevents any form of generalisation.

4. Towards an understanding of encyclopaedia authority in general

From the understanding that the authority of a published text is related to the number of institutions which hold copies of the materials and which make these materials accessible to others people,⁴⁴ the dissemination of science and technology encyclopaedias offers a measure of their authority. More specifically, the current chapter highlights the fact that different encyclopaedias have different degrees of dissemination; hence a different probability of being considered authoritative. For the purpose of comparison, the most widely disseminated encyclopaedias observed from this study reached over a thousand institutions whereas the least disseminated were restricted to a single institution.

Additionally, the analysis of the dissemination pattern of the science and technology encyclopaedias (as well as the analysis of the dissemination pattern of the most popular titles) indicates that there are factors which influence the dissemination of science and technology encyclopaedias. The name of the publisher in particular had a positive influence on the level of dissemination. Indeed, publishing an encyclopaedia with a renowned publisher such as Elsevier/Academic Press or Wiley may increase –but not guarantee– the probability for this latter to reach a wider range of countries and institutions. Similarly, diversifying the format of delivery may increase –but not guarantee– the level of dissemination of published encyclopaedias. There might be other

⁴⁴ See Chapter 1, Section 4.1.b on p.34

factors (or a combination of factors) which may be determinant in the encyclopaedia dissemination but exploring all of them exceeds the scope of the thesis.

CHAPTER 8.

ENCYCLOPAEDIA DEVELOPMENT

The current chapter investigates the extent to which encyclopaedias are playing the role of cognitive authorities and the ways whereby encyclopaedia authors contribute towards that process. Several points raised in Chapter 1 on cognitive authority –and echoed in Chapter 5 on the study of *Wikipedia* authority– are at the heart of this study. Firstly, it is indicated in the thesis earlier chapters that the role of cognitive authorities goes beyond the provision of information and includes the provision of informed opinion to help readers in times of uncertainty and controversy.⁴⁵ Second, it is suggested that the way in which information is communicated may help establish authority.⁴⁶ Thirdly, the authority of a text is strongly linked with the authority and motivation of the authors.⁴⁷ The current chapter considers specifically the case of five encyclopaedias with articles on one of the most debated topics in the 21st century: the issue of global warming and climate change (GW&CC). Here, authority is studied principally from the angle of encyclopaedia development and from the perspective of encyclopaedia authors in an attempt to address the questions:

- What are the authors' views regarding the role of encyclopaedias and the nature of encyclopaedic knowledge?
- What are the authors' objectives while writing encyclopaedia articles?
- What are the authors' approach to the communication of scientific uncertainties and controversies (SU&C)?

⁴⁵ See Chapter 1, Section 2 on p.19

⁴⁶ See Chapter 1, Section 2 on p. 19

⁴⁷ See Chapter 1, Section 2 on p. 19; See also Chapter 5, Section 4.1 on p.126

The chapter starts by introducing the five encyclopaedias considered in this study. The chapter then provides background information on the authors who participated in the survey. But the focus of the chapter is chiefly on summarising the authors' experience with encyclopaedia development; more specifically their understanding of the nature and role of encyclopaedias, as well as their approach to the communication of SU&C. In the latter case, the main stages in the process of writing encyclopaedia article are identified before the various communication strategies used in each stage are revealed. The chapter ends by discussing the implications of the various approaches to encyclopaedia development to our understanding of encyclopaedia authority.

Unless specified otherwise, all websites and online materials mentioned in the footnotes of this chapter were accessed on 31st January 2009 whereas the justification for the study and the details of the methodology followed for the email survey which was conducted in May and June 2009 are provided in Chapter 3.⁴⁸

1. Introduction to the study

1.1. Encyclopaedias targeted in the study

The authors surveyed for this study contributed to one or several articles pertaining to global warming and climate change (GW&CC) within the following sources:

- *The Encyclopaedia of Global Warming and Climate Change*
- *The Oxford Companion to Global Change*
- *The Encyclopaedia of Earth*
- *Encyclopaedia Britannica*
- *Wikipedia*

A description of these encyclopaedias is provided below while a brief overview of the editing guidelines for these encyclopaedias is offered in Appendix 2.

⁴⁸ See Chapter 3, Section 3.2 on p.74

The *Encyclopaedia of Global Warming and Climate Change*

This encyclopaedia was published in 2008 by SAGE under the general editorship of S. George Philander who summarises the general objective of the volume as follow:

The articles amount to *more than a catalogue of terms*; they are part of one story about global warming and how it is likely to affect our world.... As the volume intends, it has become increasingly essential to bring the multiple global warming issues, concepts, theories, examples, problems, and policies in one place, with the goal of *clearly explaining an emerging way of thinking* about people and their planet... Altogether, we hope the encyclopaedia *provides some groundwork for further discussion and spurs possible action* to curb global warming (Philander 2008, p.vii; emphases added).

Although the SAGE encyclopaedia gives prevalence to discussions around climate change issues in each of the US States, space is also allocated to the case of different countries around the world. In addition, the encyclopaedia provides detailed background on atmospheric, climatic and oceanic science. There are also separate articles for key figures and research institutions studying climate change, relevant governmental and international agencies, or major programmes and international conventions. This encyclopaedia incorporates articles on the societal dimension of climate change; yet, the focus is limited to societies in the US and other industrialised nations.

All 733 articles within the SAGE encyclopaedia were targeted for this study.

The *Oxford Companion to Global Change*

This encyclopaedia was edited by Andrew S. Goudie and David Cuff and published by the Oxford University Press (OUP). The first edition was published in 2002 whereas the second edition –which is the edition considered in this study–was published in 2008.

In the Preface of the OUP encyclopaedia, it is stated that the goal of the encyclopaedia is “to capture our current knowledge of natural and anthropogenic changes in the Earth's physical, chemical, and biological systems and resources and to examine the effects of those changes on human society” (Goudie and Cuff 2008, p.i). It is further added that the decision to develop a

new edition in 2008 was made firstly to satisfy the increasing public interest and awareness of global warming following the release of Al Gore's documentary *An Inconvenient Truth* (2006) and the publication of key documents such as *The Stern Review* (2007) and the *Fourth Assessment Report by the Intergovernmental Panel on Climate Change* (Pachauri and Reisinger 2007). Secondly, the editors intended to reinforce the widespread recognition that the issue of global warming is no longer debatable. Unlike the other encyclopaedias considered in this study, the OUP encyclopaedia apparently strives to not only clarify existing debates within society but also to mirror the general findings of the IPCC's Fourth Assessment Report.

As in the case of the SAGE encyclopaedia, the OUP encyclopaedia seems to have a human-centred approach to the GW&CC coverage. Many articles are dedicated to anthropogenic factors to climate change, society's use (and abuse) of natural resources, as well as society's efforts to mitigate climate change. However, the OUP encyclopaedia has a broader scope than the SAGE encyclopaedia in the sense that it does not favour the US readership as much. Indeed, climate change is more often discussed at the ecological and regional levels rather than at the States and country ones.

All 219 articles within the OUP encyclopaedia were targeted for this study.

The Encyclopaedia of Earth

This is one of the numerous portals within Digital Universe which is a supplier of business communication service and which collaborates with many partners for content development (Korman 2006). In the case of the *Encyclopaedia of Earth*,⁴⁹ Digital Universe collaborates with the Environmental Information Coalition (EIC) the National Council for Science and the Environment (NCSE).

The *Encyclopaedia of Earth* is peculiar in that it uses wiki technology but allows only experts and editors who are registered and approved by the *Encyclopaedia of Earth* staff to edit existing articles or access edit history. All submissions are first reviewed and approved by some topic editors before online publication. Although EIC and NCSE are both American institutions, the 1,000 scholars

⁴⁹ See <http://www.eoearth.org>

contributing to the encyclopaedia are from over 60 countries. The encyclopaedia is also peculiar in that its content is not limited to original articles. Indeed, the encyclopaedia borrows existing materials from EIC partners as well as open content sources which are usually reproduced verbatim with minor editing. governmental or technical reports, full-texts of international treaties and convention, but also entire e-books –particularly environmental classics– are sometimes entered as single articles within the encyclopaedia. Among many examples are *Climate Change and Foreign Policy* (2007) or Simon Hardin’s paper on “The Tragedy of the Commons” (1968).

On its website,⁵⁰ it is explicitly stated that the *Encyclopaedia of Earth* is intended not only to provide the public with a “central repository of authoritative information” for all but also to develop “the largest reliable information resource on the environment in history”. The encyclopaedia also aims to increase the “likelihood of articulating the whole truth about all subjects”. In fact, there seems to be a particular emphasis on the action of humans on their environment throughout the entire encyclopaedia. In fact, a specificity of the *Encyclopaedia of Earth* is its ongoing effort to encourage the broadest public participation in environmental actions, and to assist the public in making up their own minds about controversial topics without advocating any particular position on environmental issues.

Content on GW&CC within *The Encyclopaedia of Earth* is found in a special section of the website labelled *The Climate Change Collection*.⁵¹ Like in the OUP encyclopaedia, one might detect throughout *The Climate Change Collection* an emphasis on anthropogenic climate change theories –as opposed to natural climate change ones. This emphasis is also reflected in the “Note for contributors” which starts with the following paragraph:

Climate change and global warming are topics that incorporate a vast array of scientific, technical, and policy issues. Documented human-caused global warming is now or will affect every environmental and social system on the planet.

⁵⁰ See http://www.eoearth.org/article/About_the_EoE

⁵¹ See <http://www.eoearth.org/climatechange>

Because the collection is, however, still a work in progress,⁵² only the 99 completed articles available to the public as of January 31st 2009 were considered in the current study.

Encyclopaedia Britannica

A lot of information is provided about *Britannica* in Chapter 4. Suffice to say here that, according to its website,⁵³ *Britannica*'s objectives include the delivery of expert and up-to-date knowledge, as well as the provision and facilitation of opportunities for learning and teaching. In a material published for the promotion of the *Britannica* brand (Encyclopaedia Britannica Inc. 2012), the encyclopaedia is presented as the ultimate authority which answers the needs of the reader without the necessity to consult other materials. Indeed, *Britannica* users are told:

If you have no knowledge of a topic, then you can be confident that once you have read *Britannica* on the subject, you will have a very good idea of what that topic is about. You don't have to research further unless you wish to; you don't have to wonder about the source or the quality of the information (Encyclopaedia Britannica Inc. 2012, p.11).

Within the thousands of articles in *Britannica*, there is one article entitled "global warming" but there is also content pertaining to GW&CC in various articles on the climate and weather; on the biological and ecological systems; as well as on human activities and initiatives, including articles on various the international agencies such as "United Nations Environment Programme" and "World Meteorological Organization".

In total, 27 articles pertaining to GW&CC from *Britannica* were considered in the current study.

Wikipedia

Detailed information on *Wikipedia* is provided in Chapter 5.

As mentioned in Chapter 5, the general vision shaping all Wikimedia products is "a world in which every single human being can freely share in the sum of all

⁵² The Climate Change Collection' s table of content targets 577 articles

⁵³ See <http://www.britannica.co.uk/>

human knowledge.”⁵⁴ Beyond this broad vision, the primary goal of *Wikipedia* as an encyclopaedia is “to be *fully* comprehensive and informative reference work; that is, it does not purposefully omit (i.e. suppress or censor) non-trivial, verifiable, encyclopedically-formatted information on notable subjects.”⁵⁵ *Wikipedia* does not shy away from information which could be considered, illegal, immoral, unethical, or potentially harmful, because, according to its ethos,

Wikipedia' s place is to merely *provide* useful information; what people *do* with that information is entirely up to them and is either none of *Wikipedia*' s concern or it is believed that the world is better overall for the information being available than if it were not.

This said, not all information is allowed on *Wikipedia*. For instance, articles may not contain original research; i.e. previously unpublished arguments, concepts, data, theories, or any new analysis or synthesis of these.⁵⁶ Content with conflict of interest and self-promotion are equally banned from *Wikipedia*.⁵⁷

Unlike other encyclopaedias, there is neither a table of contents nor a list of all existing articles for the entire *Wikipedia*. Instead, there are several “portals” and “Index” under which some *Wikipedia* users try to list existing articles pertaining to specific topics. To locate the GW&CC articles within *Wikipedia*, the *Climate Change Portal*,⁵⁸ the *Global Warming Portal*⁵⁹ and the *Index of Climate Change Articles*⁶⁰ were checked. A total of 282 articles were identified this way on 31 January 2009 and considered in this study.

1.2. Authors participating in the study

Out of the 833 people who contributed to the encyclopaedia articles mentioned in the previous section, 717 were contacted by email, of whom 75 responded

⁵⁴ See <http://www.wikimediafoundation.org>

⁵⁵ See http://en.wikipedia.org/wiki/Wikipedia:Wikipedia_is_comprehensive

⁵⁶ See <http://en.wikipedia.org/wiki/Wikipedia:NOR>

⁵⁷ See http://en.wikipedia.org/wiki/Wikipedia:Conflict_of_interest

⁵⁸ See http://en.wikipedia.org/wiki/Portal:Climate_Change

⁵⁹ See http://en.wikipedia.org/wiki/Portal:Global_Warming

⁶⁰ See http://en.wikipedia.org/wiki/Index_of_climate_change_articles

and filled the survey questionnaire.⁶¹ This corresponds to a response rate of 10.46 percent. Details of the author distribution across the various encyclopaedias are provided in Table 9 on p.183. In comparison with the distribution of the 833 authors in targeted population, authors from the SAGE encyclopaedia were definitely over-represented whereas those from *Britannica* and *Wikipedia* were under-represented.

It should be noted that not all participants were authors in the traditional sense of the term. Some of them had to complete more routine tasks in the process of developing encyclopaedia. On top of writing articles, they, for instance, had “to be as up-to-date as [he] could be” (A22_{EB}), “to spread the recent news” (A75_W), and “to make sure the article remained relevant for years to come” (A48_{SAGE}). Other authors paid particular attention to specific components of the encyclopaedia article by providing clear definitions (A51_{SAGE}), by providing international examples (A69_{SAGE}), by highlighting key issues (A59_{SAGE}), by listing references on the topic (A44_W), or by representing the existing range of research (A70_W). In the case of user-generated encyclopaedias such as *Wikipedia*, many authors specialised in the completion of specific tasks instead of focusing solely on any particular article. They wrote: “My edits have been to organize the information already present and to keep the article up to *Wikipedia* standards such as verifiability and neutral point of view” (A67_W), “I’m just supplying interesting information that could be useful in historical analysis or in predicting the future” (A39_W), “I have endeavoured to bring new results from the state of the art in the field” (A46_W), “I provide the reader links for further study” (A70_W), “I rewrote the article to be more scientific” (A38_W), and finally –in the case of the *Encyclopaedia of Earth*– “My role is to ensure that [the article] is well-presented” (A66_{EOE}).

When asked to provide the name of the institution where they worked, the majority of the participating authors entered academic institutions (n=53 authors). Others authors worked for governmental agencies and research institutions (n=10 authors), as well as for non-governmental organisations and private company (n=3 authors) whereas three authors were independent

⁶¹ See Chapter 3, Section 3.2.b on p.76 for details on the selection process
See Appendix 1 for a copy of the survey material emailed to encyclopaedia authors

consultants. Seven authors did not disclose information regarding their institution.

Judging from the information provided on these institutions, the most represented country was the USA (n=41 authors), followed by the UK (n=8 authors), Australia (n=6 authors), and Canada (n=4 authors). There were also authors from Germany, France, Italy, Switzerland, New Zealand, India, and Hong-Kong (one author from each country) (see also Map 3 on p.186).

Table 9. Encyclopaedias, articles and authors considered in the study

Type	Format	Encyclopaedias considered (Publisher)	Articles targeted	Authors targeted	Authors actually contacted	Authors participating
Specialised encyclopaedia	printed	<i>Encyclopaedia of Global Warming and Climate Change</i> (by SAGE)	All 733 articles	All 180 authors	164 authors	29 authors
	printed, online	<i>The Oxford Companion to Global Change</i> (by Oxford University Press) Also available from www.oxfordreference.com	All 219 articles	All 156 authors	150 authors	13 authors
	online	<i>Encyclopaedia of Earth</i> (by the Environmental Information Coalition and the National Council for Science and the Environment) Available from www.eoearth.org	Only the 99 completed articles from the <i>Climate Change Collection</i>	All 78 authors	77 authors	7 authors
Generic encyclopaedia	printed, electronic, online	<i>Encyclopaedia Britannica</i> (by Encyclopaedia Britannica, Inc.) Also available as DVD and from www.britannica.com	Only the 27 articles pertaining to climate change science	All 55 authors of the targeted articles	38 authors	9 authors
	online	<i>Wikipedia</i> (by Wikimedia Foundation, Inc.) Available from www.wikipedia.org	Only the 282 articles listed under the <i>Global warming category</i> , the <i>Climate change category</i> , and the <i>Index of climate change articles</i>	All 364 authors who contributed to 10 or more articles or who contributed to fewer than 10 articles but whose average contribution exceeded 10 edits per article	288 authors	17 authors
5 encyclopaedias			1360 articles	833 authors	717 authors	75 authors

When the 75 participating authors tried to categorise themselves in relation to the topic of their chosen article on GW&CC according to the following three options:

- Option 1: I am interested/passionate about this topic;
- Option 2: I have worked on this;
- Option 3: I am an expert on this.

As many as 19 authors indicated that they were only interested or passionate about the topic of their articles. These include authors from all but *Encyclopaedia Britannica*: 9 authors from the SAGE encyclopaedia, 7 from *Wikipedia*, 2 from the *Encyclopaedia of Earth* and 1 from the OUP encyclopaedia. By contrast, 25 authors said that they also worked on the topic although they did not consider themselves as experts whereas another 28 authors said they were definitely experts on the topic of their chosen article. This was the case for all authors from *Britannica*, as well as 20 authors from the SAGE encyclopaedia, 12 authors from the OUP encyclopaedia and 9 authors from *Wikipedia* (Figure 27). The difference observed in the answers provided by authors from the different encyclopaedias was however not significant.

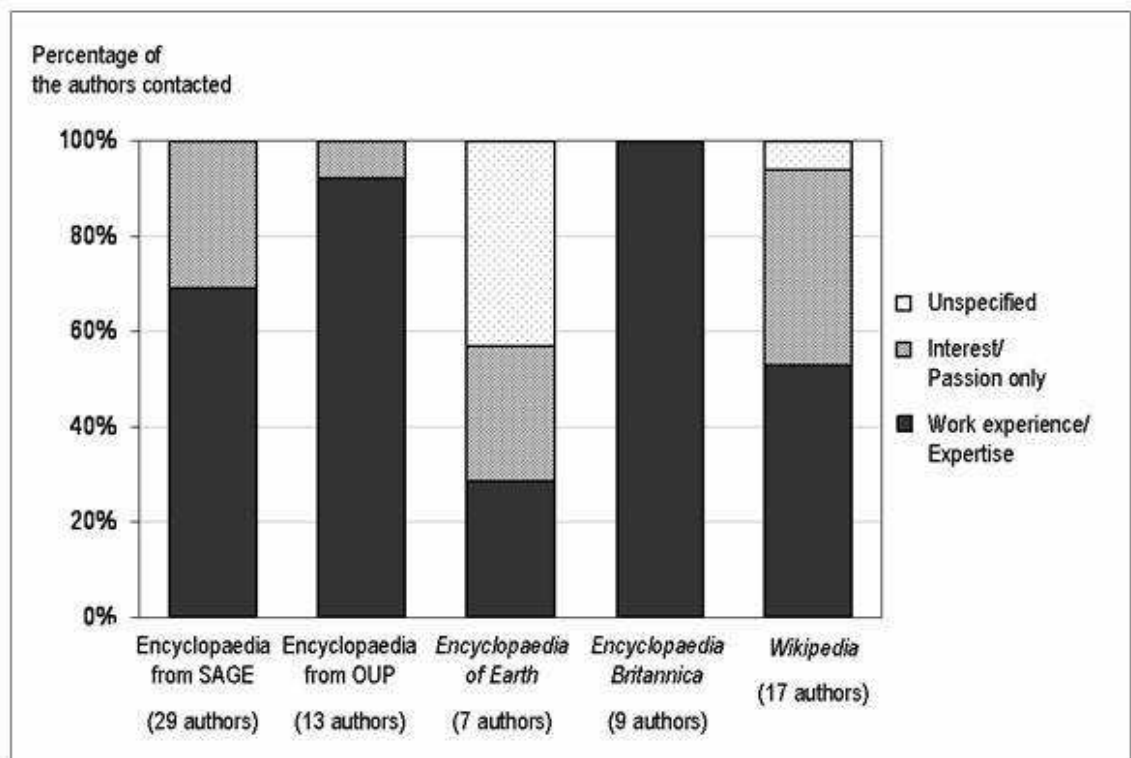


Figure constructed from the information within 75 filled questionnaires

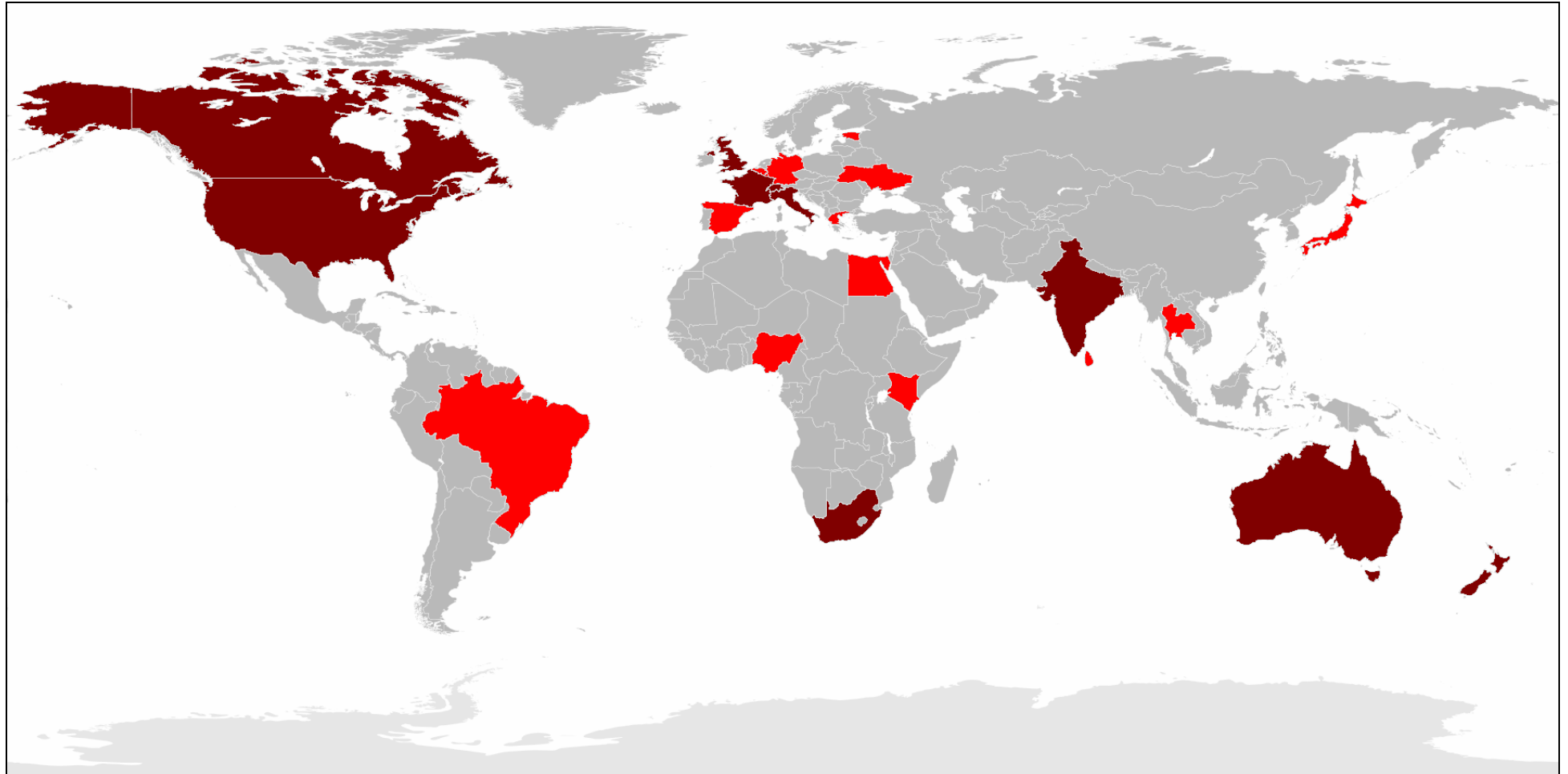
Figure 27. Authors' involvement with the topic of their article

1.3. Articles considered in the study

GW&CC science encompasses a wide diversity of topics. The encyclopaedia articles chosen by the participating authors to be discussed within this study were equally diverse; ranging from earth and atmospheric science to social science.

Most authors agreed to reflect on GW&CC articles from the five targeted encyclopaedias for this study. However, one author chose to reflect on articles from both the *Encyclopedia of Global Environmental Change* (published by Wiley in 2002) and *Encyclopedia of Climate and Weather* (published by OUP in 1996); two other authors chose different articles from the *Encyclopedia of Global Environmental Change*; and another author chose an article from the *Dictionary of American History* (published by Charles Scribner's Sons in 2003).

Finally, when authors were asked about existing SU&C within their chosen articles, they tended to talk more about scientific controversies than about scientific uncertainties. In five cases, the authors did not perceive their articles as some with SU&C (A01_{SAGE}, A07_{SAGE}, A20_{SAGE}, A57_{SAGE}, A68_{OUP}). One of them explained that, in his article, the existing controversy was not of a scientific nature but rather of a political one (A68_{OUP}). But even the authors whose articles did not have SU&C gave their opinions about how knowledge should be presented or how SU&C should be communicated.



Map constructed from the information about 429 contacted authors (the 288 *Wikipedia* authors not represented)
In dark red are countries from which some of the contacted authors participated in the study
In red are countries from which none of the contacted authors participated in the study

Map 3. Origin of the authors of encyclopaedia articles on global warming and climate change

2. Authors' experience of encyclopaedia development

Before describing the various approaches adopted for the communication of SU&C, the current section starts by summarising the authors' understanding of the nature of encyclopaedias. The authors' responses are grouped under the following three rubrics:

- What are encyclopaedias?
- How to present scientific knowledge inside encyclopaedias?
- What to achieve through encyclopaedia articles?

2.1. Understanding of encyclopaedias

What are encyclopaedias?

Although the question above was not specifically asked, the participating authors sometimes gave explicit statements regarding their understanding of the nature of encyclopaedias. Unsurprisingly, an encyclopaedia was described as “a compendium” (A_{EOE}.66) or “a reference in a large printed, permanent format that is nevertheless just a snapshot of knowledge” (A58_{SAGE}). One author added that an encyclopaedia was “a place where people could get a quick outline of [various hypotheses]” (A39_W).

Encyclopaedia authors, however, did not always expect encyclopaedias to provide definitive answers to the readers' questions. For instance, one author claimed that an encyclopaedia “should be a taster for people, not the 'last word'” (A63_{SAGE}). Similarly, another author stated: “this is not the canon of scripture, but a starting point for research” (A16_{EOE}). In fact, an encyclopaedia was simply seen as a material which was “educational... and a useful starting point for research” (A64_{SAGE}). In other words, “the role of an encyclopedia is to present a brief overview of the topic; to provide courses of direction for future research” (A66_{EOE}) and to provide “a general background on the subject with references for in-depth reading” (A28_W).

How to present scientific knowledge inside encyclopaedias?

In general, the knowledge within the GW&CC articles chosen by the participating authors was considered relatively complex (Figure 28). When assessing the status of the knowledge on the topic of their articles, authors were primarily asked to consider four pairs of contrasting aspects:

- Knowledge with simple with discrete facts versus knowledge with complex and interrelated concepts;
- stable versus evolving knowledge;
- absolute versus tentative knowledge; and
- single versus multiple versions of knowledge.

From the options ticked, the participating authors indicated that the knowledge was more often considered to be complex with many interrelated concepts (n=49 authors) than simple and factual (n=22 authors); and more often considered to be evolving (n=59 authors) than stable (n=17 authors).

In addition, several authors provided additional comments regarding the status of knowledge around the topic of their article. A couple insisted on the complexity of this knowledge. More specifically, one author (A40_W) highlighted the combination of scientific and political questions within the article whereas another author (A42_W) deplored that politics [and] religion are “dressed up as science” to form –what he denounces as– “pseudo-science pretending to be science”. Other authors commented on the tentative and evolving nature of knowledge. For instance, one author (A67_W) used the adjectives “theoretical and speculative.” Another author (A69_{SAGE}) added that his article is in an “emerging field of research” with the measurements “not yet completely defined” and the knowledge “not yet completely established.” Another author (A38_W) explained that, “as with most science, there is a very stable core, with deeper and more detailed understanding still evolving.” Similarly, one author (A48_{SAGE}) wrote about his topic that “the overall concept ... and some of its impacts are well understood. However, the physical mechanisms behind it [are] much debated.” In one case, the author (A71_{EB}) even indicated that that the consensus around his topic “changes frequently.”

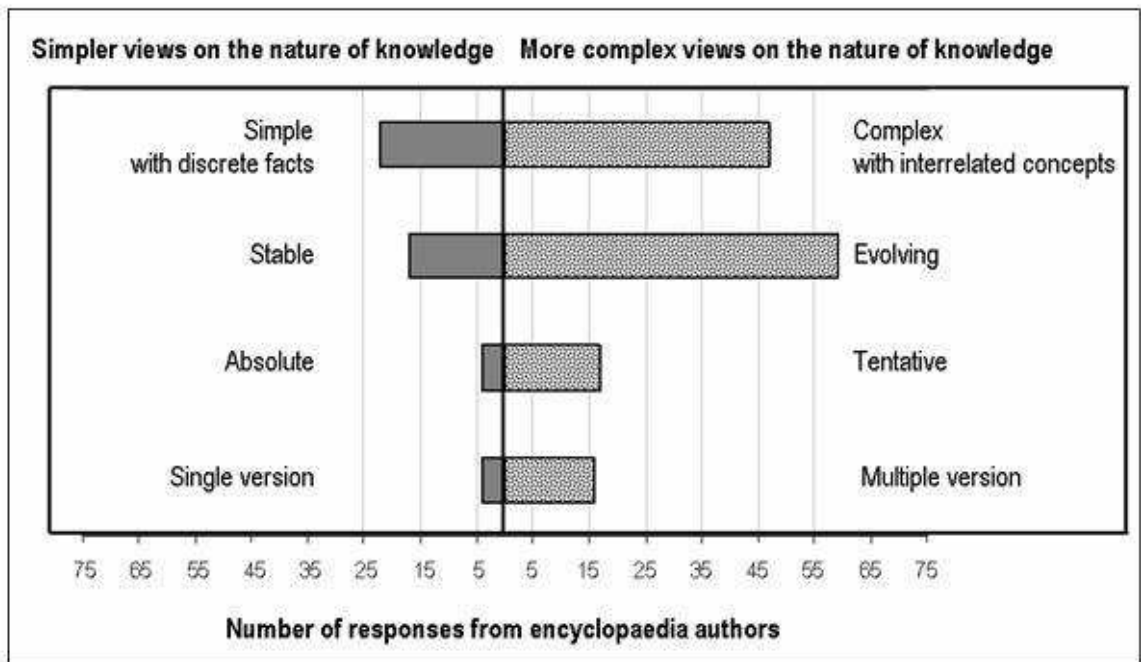


Figure constructed from the information within 75 filled questionnaires

Figure 28. Authors' views on the nature of scientific knowledge

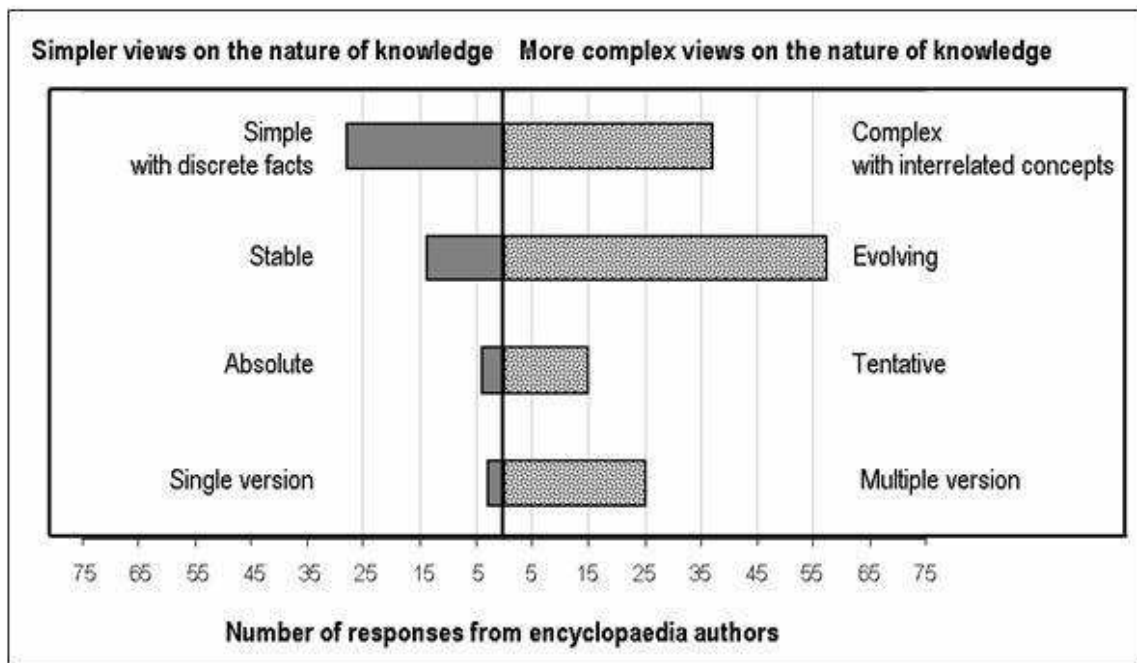


Figure constructed from the information within 75 filled questionnaires

Figure 29. Authors' views on the nature of encyclopaedic knowledge

Comparing the authors' assessment of the status of knowledge on the topic of their article (Figure 28) and authors' assessment of how the knowledge should be presented within the encyclopaedias (Figure 29), 55 percent of the authors wanted to present knowledge "as it is". As many as 20 percent of the authors wanted to present a simplified version of the topic (mostly those who perceived that the topic originally had complex and interrelated concepts or tentative knowledge) whereas 15 percent took the exact opposite approach and preferred to present various versions of the current knowledge with more complex and interrelated concepts, or present the knowledge as more evolving and more tentative. The remaining 10 percent of the authors wanted to present their article in a particular way –for example they always present different versions of knowledge, or they always stress the evolving aspect of science– regardless of how they assessed the nature of knowledge in their topic (See also Figure 30).

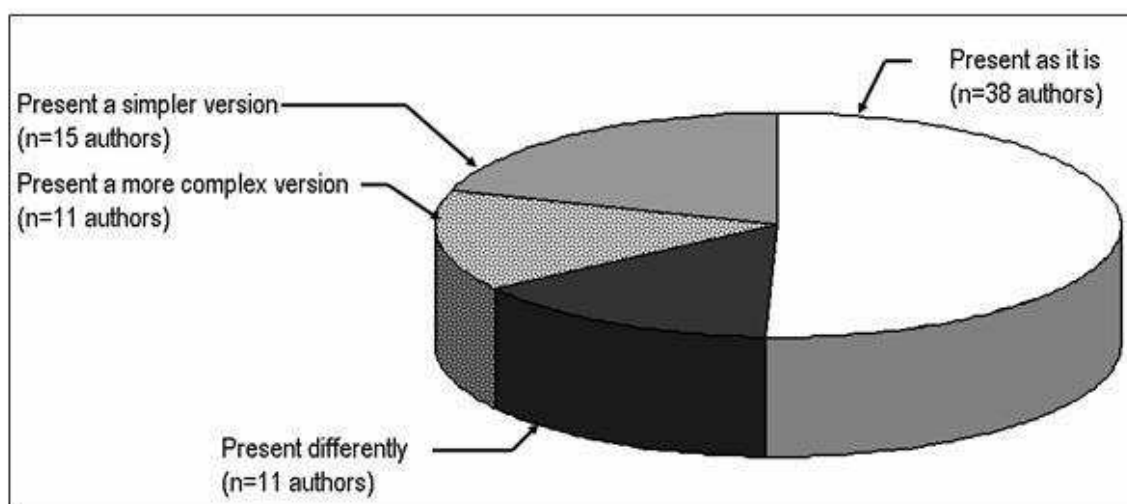


Figure constructed from the information within 75 filled questionnaires

Figure 30. Authors' views on presenting scientific knowledge within encyclopaedias

What to achieve through the encyclopaedia articles?

When the authors reported on what they were trying to achieve with their articles, providing information to the public was the main concern of most of them. In their statements, authors used expressions such as "introduce" (A9_{OUP}), "communicate" (A5_{OUP}, A11_{SAGE}), "describe" (A2_{SAGE}, A17_{SAGE}), "present" (A30_{EB}, A55_{OUP}), "convey" (A71_W) "report on" (A12_W), "inform on" (A21_{SAGE}, A31_{OUP},

A61_{EOE}), “tell about” (A54_{EB}), “lay out the facts on” (A42_W) “provide information on” (A35_W), or “pass along the knowledge of” (A62_{SAGE}) specific aspects of the topic covered in the articles of their choice. There were also many cases where the authors said they provide “an overview” (A66_{EOE}, A68_{OUP}, A70_W), “a summary” (A65_{OUP}, A57_{SAGE}), “a synopsis” (A59_{SAGE}) or “a snapshot” (A2_{SAGE}) of the entire topic.

There was a wide range of information considered worthy of encyclopaedic coverage. Most of the authors only presented in their articles what they personally considered as “the general background” (A28_W, A43_W) and “the basic information” (A56_{OUP}) –also referred to as “the basic facts” (A10_{SAGE}, A68_{OUP}), “the basic picture” (A23_{OUP}) or simply “the basics” (A48_{SAGE}, A55_{OUP})– as well as “the key elements” (A9_{OUP}) and “the essential facts relevant to the topic (and the theme of the encyclopedia)” (A56_{OUP}).

Other authors adopted a more populist approach and made sure to cover not only the mainstream views or “the data that is most founded and has the greatest support amongst scientists” (A32_{SAGE}) but also the “points most talked about”. The following quote clearly illustrates this latter approach:

Tens of thousands of respected scientists in the United States have recently signed a petition to the Congress citing their concerns [regarding specific aspect of global warming]. Be that as it may be, real science will eventually prove it one way or the other. In the meantime, students and the general public is seeking information on this topic. It would not be responsible for the *Encyclopedia of the Earth* not to have articles regarding this in their collection (A66_{EOE}).

Three authors, however, admitted to emphasis on less popular points (A36_W, A43_W, A70_W). For instance, one of them wrote:

[I wanted] to highlight an important but relatively poorly understood [point] and its presentation in general literature (A36_W).

Other authors insisted that both popular and less popular points have to be covered inside encyclopaedia articles, even if not necessarily in an equal fashion (e.g. A48_{SAGE}, A37_W, A41_W, A43_W). They explained:

The article has to, as far as possible, reflect the mainstream view on the subject, note any significant minority views, and inform the non-technical reader of the relative strengths of these cases (A41_W);

The vast majority of the information should be ‘the facts’, information largely not disputed across the discipline and

considered ‘common knowledge’. The article would be remised if it did not also include the prevailing knowledge and opinions, even if considered tentative or evolving knowledge. I (and other editors) have tried to maintain the general consensus position (A48_{SAGE}).

Another criterion for information to be considered worthy of encyclopaedic coverage lies in both the context and the reliability. One author explains:

I hoped to present enough stable information to ensure the article’s credibility, but juxtapose it with a critical flavor that communicates not just the facts but the context in which those facts must be interpreted (A24_{SAGE}).

A few authors seemed to find historical background particularly important in defining the context of a topic (A16_{EOE}, A27_{EB}, A68_{OUP}).

Also, in two cases, the author took the encyclopaedia content beyond the limits of existing knowledge. Indeed, one author attempted “to interpret systematically collected observational data ... in the light of present day understanding of [the topic]” (A25_{EB}) whereas another author attempted “to summarize and specify the known... and to offer informed speculation on where the situation is heading” (A58_{SAGE}).

Beyond the knowledge of facts, many authors wanted encyclopaedia readers to get an understanding of the topic in general and of some of the more detailed aspects of it in particular. At least 21 authors used the verb “understand” –as in the expression “I want the reader to understand...”– or the noun “understanding” –as in “I want the reader to get an understanding of...”. There was a desire to dispel myths and misconceptions among the general public and to establish “the truth” (e.g. A13_{SAGE}, A42_W, A41_W). Authors particularly condemned and tried to counter-act the information conveyed by politicians (e.g. A72_W) or by the media (e.g. A38_W, A47_W). The quotes from the two authors below illustrate this last point:

The fact that present uncertainty is not as great as often portrayed in popular media and that any controversy is perhaps more political than scientific is what we wanted our encyclopedia article to capture (A58_{SAGE});

I want people to be able to look at the issue of climate change objectively, rather than react emotionally under the influence of popular press that has overemphasized controversy and given too much voice to so-called sceptics (A15_{SAGE}).

Some authors wanted their readers to engage more fully with the knowledge communicated. They wanted the readers to critically analyse the information provided (A6_{SAGE}), to seek alternative ways of approaching the topic of GW&CC (A62_{SAGE}), to consider various disciplines while investigating the various issues (A64_{SAGE}), and to continue researching the issue beyond the encyclopaedia article (e.g. A30_{EB}, A61_{EOE}, A57_{SAGE}, A59_{SAG}) in order to be better armed when facing on-going debate on GW&CC. The general objective is that

readers will understand the range of approaches, and the strengths and limitations of each when they next hear statements about past climates. They might thus be able to judge such statements from a more educated viewpoint (A62_{SAGE}).

In the case of policy-makers in particular, the objective is “to promote a deeper and more critical view on these [approaches]... for a better usage of those at policy-making level” (A6_{SAGE}), “for informed policy choices” (A40_W). The ultimate goal seems, however, to encourage their readers into action: “engage others in the plight of these small island nations whose future is at risk due largely to the actions of others” (A29_{SAGE}), “to act to prevent climate change” (A45_{EOE}).

Finally, there were a few times when authors admitted using the encyclopaedia article to advocate specific positions within the climate change debate. See for example the following quotes

I want people to know that more is known about climate change than many people believe and the effects of climate change are tangible (A15_{SAGE});

I was hoping readers would understand that climate change IS already having an impact (A58_{SAGE});

[I wanted to] make it clear that many "sceptics" rely, implicitly or explicitly, on conspiracy-theoretic reasoning. I hope readers will recognise this and apply real scepticism to alleged "sceptics" (A37_W).

2.2. Approach to the communication of scientific uncertainties and controversies

2.2.a. Stages in the writing process

When encyclopaedia authors were asked to describe their experience with writing articles with SU&C, the responses could be organised in a way that defines a general framework of the writing process. Basically, this process seemed to have two stages: a planning stage and a writing one. Most authors focused on the first stage and explained what they wanted to achieve through the encyclopaedia article, how they choose the SU&C to present, and what they do with the uncertain/controversial aspects. Fewer authors talked about how they actually wrote the sections with SU&C. There were also authors who indicated that the writing process was influenced by three main factors: the author's own experience and personality, the intervention of other people such as co-authors, editors, and the general context of the writing task such as the type of encyclopaedia, or the nature of the topic.

Figure 31 summarises the writing process and presents the three decisions that authors needed to make in the centre. The three sources of influence are shown through the vertical bars in the background. The framework suggests a relatively linear depiction of the authors' experience; yet, authors probably proceed in a less predictable fashion. In fact, one of them even admitted that he does not follow any strategy (A9_{0UP}).

2.2.b. Strategies for the communication of scientific uncertainties and controversies

The question "What to achieve through the encyclopaedia articles?" is covered in Section 3.1, starting on p.190. The current section then focuses on the three remaining questions from the framework; namely

- How to choose the uncertainties and controversies to cover?
- What to do with the uncertain and controversial aspects?
- How to write the sections with uncertainties and controversies?

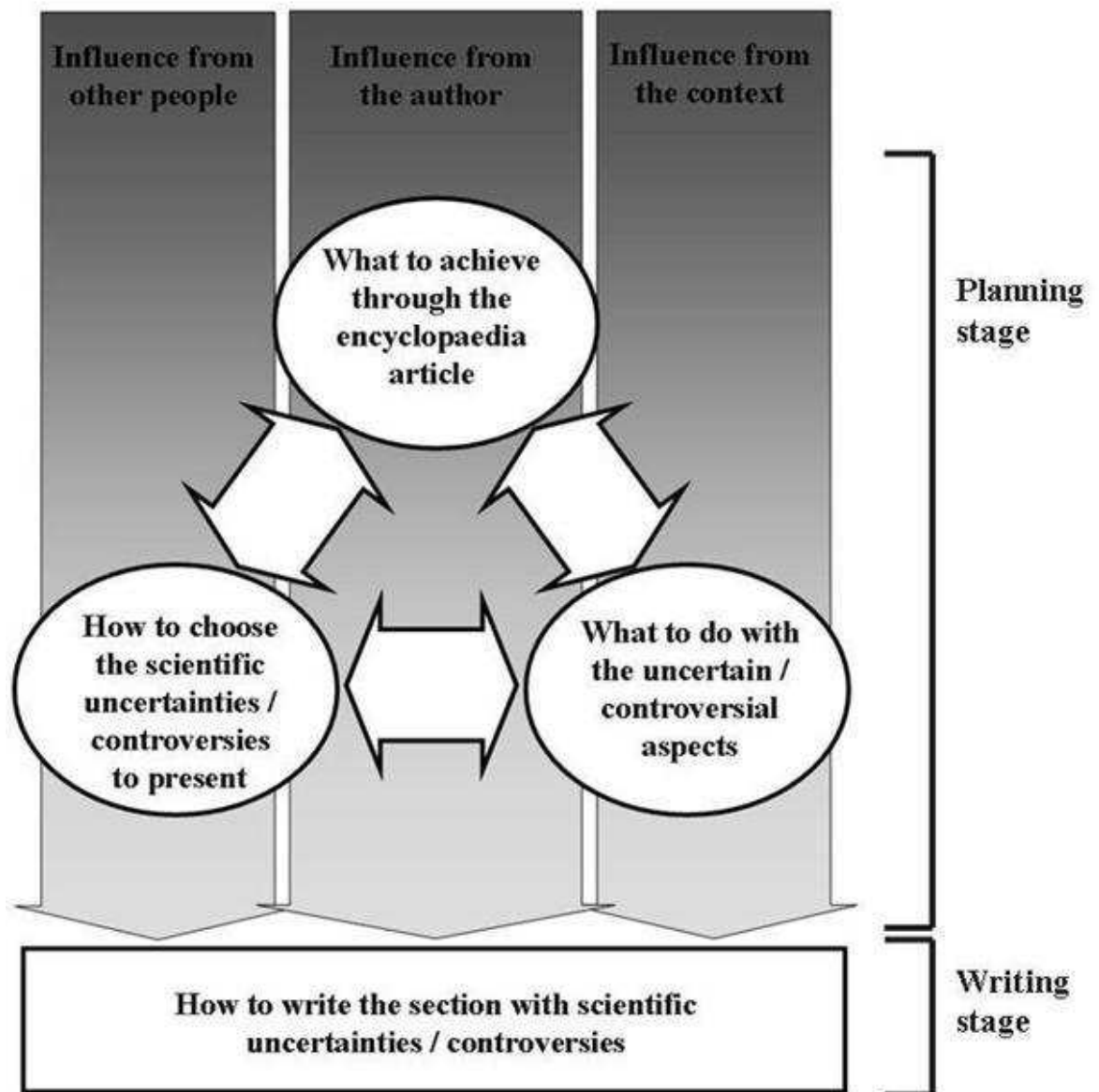


Figure 31. Authors' approach to the writing of encyclopaedia articles

How to choose the uncertainties and controversies to cover

Three main strategies were reported when it came to choosing the SU&C to present within encyclopaedia articles:

- Choose all SU&C;
- Choose some of the SU&C; or
- Choose none of the SU&C.

Several authors reported to have presented all SU&C they were aware of (e.g. A15_{SAGE}, A34_{SAGE}, A27_{EB}, A33_{EB}, A38_W, A36_W) yet they almost never justified their strategy. One author simply explained that he attempted “to give the full story... and to make it clear in the article that the [issues] are not as straightforward as initially thought” (A43_W).

The majority of the authors, however, chose to cover only a subset of possible SU&C and focused on those deemed crucial to the topic. The SU&C were part of “central issues” within the article (A65_{OUN}) and they were “necessary for comprehensiveness” (A67_W), they formed “issues of wide concern with the potential to have intense and large scale ramifications” (A15_{SAGE}), or they were “of modern relevance” (A64_{SAGE}). Other authors focused on the popular SU&C: the most talked about within the scientific community and the public arena, for example the uncertainties related to the polar bear survival in response to global warming, or the controversy around the role of solar variation in climate change. Similarly, one author indicated that he may have covered a specific SU&C in his article because “there is a revival of interest in this topic” (A56_{OUN}). Although authors agreed with the idea of presenting SU&C, a few of them admitted intentionally selecting the least controversial ones (e.g. A48_{SAGE}, A50_{SAGE}).

In fact, choosing the SU&C to present may be seen as a rather arbitrary process, particularly when authors tried to make a specific argument or when they wanted to present a scope of perspectives to the readers (e.g. A30_{EB}, A62_{SAGE}). This tendency is reported to be particularly increasing in *Wikipedia*, if one believes the observation made by the following author:

Cherry picking is the one word summation. Editors can choose which studies to include or exclude (...). The current trend (after a hotly contested Arbitration action) on *Wikipedia* is to cherry pick [some views] while censoring even the existence of others (A44_W).

Other authors based their decision on more pragmatic ground and selected the SU&C to present in their article, for instance “because [these SU&C] are related in sequence” (A27_{EB}).

But not all authors agreed to present SU&C. Indeed, out of the 70 authors who wrote on topics containing at least one SU&C, several authors clearly stated that they had not covered any SU&C (e.g. A2_{SAGE}, A19_{EOE}, A45_{EOE}, A28_W). Some of

them argued that existing SU&C were not essential to their article which focused on other aspects of the topic (e.g. A61_{EOE}, A74_W). Other authors indicated that, at the time of the writing of the encyclopaedia article, the state of knowledge on the topic was barely emergent (e.g. A5_{OUP}, A30_{EB}, A32_{SAGE}). In addition, one author justified his avoidance of SU&C in the following terms

I did not address these "controversies" as they are not opinions that are held by the majority of the scientific community (A32_{SAGE}).

What to do with the uncertain and controversial aspects

Once the encyclopaedia authors had chosen which SU&C to cover in their articles, they used a range of strategies regarding what to do with the information. In general, the authors' strategies for the communication of SU&C mirror their objectives for writing the encyclopaedia articles as described in Section 3.1.

At the most superficial level, there were many authors who just wanted to "mention" (e.g. A23_{OUP}, A39_W), "allude to" (A29_{SAGE}), "touch on" (A15_{SAGE}) the existence of SU&C, as well as authors who wanted to "cover [SU&C] in brief" (A31_{OUP}), to "cover [SU&C] to a limited degree" (A9_{OUP}), and "not to stress [SU&C] at all" (A8_{OUP}). By contrast, there were some authors who deliberately tried "to keep the uncertainty in the subject in plain view" (A43_W) or "to emphasize [SU&C]" (A6_{SAGE}). There were even a few authors who dedicated their entire article to the SU&C (e.g. A37_W, A36_W).

Clearly, the level of emphasis depended on the importance of SU&C within the topic of the article. The following quote illustrates one end of the spectrum:

The article focuses exactly on the uncertainties... I was trying to emphasize that often the interpretation of [a specific aspect of GW&CC] is naïve if not plainly wrong, and that, in spite of great advances, large uncertainties are still present (A6_{SAGE});

whereas this one illustrates the other end:

All [SU&C] are covered, but being only minor aspects of the topic, most only in passing (A38_W).

But the level of emphasis could also be dictated by other reasons. For instance, one author "only mentioned [the SU&C] in his article to leave it to the reader to investigate them further, especially since new data and theories may have arisen since the article was written" (A23_{OUP}).

For authors who were particularly eager to ensure that the readers get a deeper understanding of SU&C, it was possible to include different types of information and to adopt different treatments of these. A few authors went as far as making reference to the scientific process in general. So, to explain the existence of scientific uncertainties, authors reminded their readers that “there are difficulties both in getting the needed data and in the mathematical analysis of them” (A39_W), that knowledge “can not be easily inferred from the observations” (A60_{SAGE}) and that “very interesting and fundamental scientific questions are still open” (A6_{SAGE}). And, to explain the existence of scientific controversies, authors talked about the social construction of scientific knowledge (A16_{EB}, A48_{SAGE}, A20_{SAGE}).

To help the readers get a deeper understanding of a specific SU&C, encyclopaedia authors reported using the strategies below:

- Put the SU&C into the wider historical and societal context (A24_{SAGE}, A27_{EB});
- Give sufficient background on the issue (A15_{SAGE});
- Give the detailed scientific information, including key equations (A14_{EOE}) and illustrations (A41_W);
- Offer a summary of the SU&C then refer the readers to major elaboration of the issues in the literature (A55_{OUP}).

In the particular case of scientific controversies, offering the readers a “balanced” coverage seemed to be a priority for most authors; yet, this also seemed to be one of the most challenging tasks. A popular strategy consists of covering only the mainstream views which were generally defined along the line of “opinions that are held by the majority of the scientific community... data that is most founded and has the greatest support amongst scientists” (A32_{SAGE}). Another strategy consists of providing all viewpoints, including the minority perspectives (e.g. A27_{EB}, A41_W). Here, some authors made sure that their articles clearly indicate what is known for sure versus what is still uncertain or controversial (A8_{OUP}, A55_{OUP}, A35_W) or, in other words, identify “the parts which are certain and the parts which are still evolving” (A38_W). Other authors preferred to present their own analysis of the controversy. One author in particular “[looked] for the central tendency amongst all the arguments” (A4_{OUP}), another author provided “the best knowledge/opinion based on evidence from sources” (A34_{SAGE}); whereas many other authors compared and

contrasted the competing arguments (e.g. A3_{SAGE}, A50_{SAGE}, A56_{OUP}). In the latter case, most of them weighted the competing arguments based on the degree of acceptance within the scientific community (A2_{SAGE}, A15_{SAGE}, A37_W) while ensuring that minority perspectives are neither underrepresented nor given undue weight (A35_W, A38_W).

Although there were a few authors who did not hesitate to voice their own conclusions and opinions regarding SU&C inside their articles, most authors remained more neutral by trying to “write open-ended items” (A59_{SAGE}), to “avoid undue speculation” (A75_W), “let the facts speak for themselves and let the reader draw their own conclusions” (A32_{SAGE}, A12_W, A42_W).

How to write the sections with uncertainties and controversies

One author warns that

General articles about climate change can sometimes tend to be too simple, leading readers to believe things are more cut and dry or straightforward than they really are (A5_{OUP}).

Authors seemed aware of this point and listed a plethora of communication strategies. These strategies could be grouped under the following categories:

- Choice of the language and vocabulary used; as well as consideration for the grammar;
- Attention to the general structure of the article;
- Use of specific features.

To counter-balance the heated discourse around the topic of GW&CC, authors believed they had to stick to a “factual language” (A48_{SAGE}) and to adopt a “calmly instructive style” (A3_{SAGE}). In fact, another author noticed that a “haughty tone alienates readers who could be brought around to the scientific majority” (A70_W). Also, to facilitate the reaching of a common understanding among readers, the use of a precise but simple terminology was reported to be effective (A35_W, A55_{OUP}).

Regarding the presentation of scientific uncertainties, encyclopaedia authors had an even longer list of strategies, including:

- Use of conditional tenses (A58_{SAGE}) and conditional terms such as “may” (A15_{SAGE}); “‘might’, ‘most likely’, ‘unclear’, ‘probably’” (A27_{EB});
- Use of irony and ambiguous endings to highlights uncertainties (A4_{OUN});
- One author reported that “quantifiers such as ‘generally’, ‘usually’, ‘some models/researchers’, etc. show that not ALL cases will conform” (A48_{SAGE}). Similarly, “qualifying statements such as ‘under the scenarios of....’” (A66_{EOE}) or “phrases such as ‘Concerns include...’” (A67_W) could flag the limits of the information communicated.

Yet, there are also things to avoid; not only some terms with derogatory connotations such as “fraud” (A37_W), but even some of the most commonly used expressions, as one author explained below:

One wants to communicate scientific knowledge, not merely recite that “we need to know more about ... (topic X). For example, the phrase “little is known about...” appears almost 1,000,000 times in a search using GoogleScholar. It’s trite to keep saying things like that (AEB₃₀).

Finally, SU&C could be hidden or highlighted depending on the organisation of the encyclopaedia –particularly when SU&C were grouped in specific sections (A44_W, A47_W). But the text within an article could also be organised in a way to better help the reader grasp SU&C. In some cases, starting the explanation of SU&C from a specific example (A55_{OUN}) or using numbers, equations, and diagrams to convey information (A60_{SAGE}, A14_{EOE}, A73_{OUN}) were also reported to effective writing strategies.

2.2.c. Factors influencing the communication of scientific uncertainties and controversies

Influence from the context

The context mentioned here is in relation to the constraints imposed by factors such as the editing policy within the encyclopaedia, the nature of the topic, etc. In traditional (printed) encyclopaedias, the typical complaint is related to the word count limits: “We are only given 500 words or so to describe a topic that needs 100,000 words or so” (A18_{SAGE}) or “There was inadequate space to treat any of the other issues” (A22_{EB}).

Influence from other people

Here, the focus was on the interventions of other co-authors and editors and on how these interventions affected the quality of the final article. The comments expressed varied from one encyclopaedia to another. For instance, in the case of the OUP encyclopaedia, one author appreciated the recommendations made by the reviewer to improve the illustrations used in the article (A73_{OUP}). For the other encyclopaedias, however, the intervention of other people was generally considered negative. In the case of *Britannica*, one author complained that the editors continued to publish an article which was submitted in 1991 without updating the facts (A27_{EB}) whereas another author complained that the editors edited out his attempt to allude to some growing controversies (A22_{EB}). In the case of the SAGE encyclopaedia, one author complained about limited feedback from and the lack of interaction with the editor; the author wrote:

I would like to have had access to the authors/write-up on related entries so that I could have edited my entry accordingly. I would also liked to have had some more interaction with the editor (A62_{SAGE}).

But it was in the case of *Wikipedia* that the highest number of complaints was received. It seemed that the process of writing an article in general –and the process of writing an article with SU&C in particular– was challenging. Because so many people endlessly argue almost each point raised within the *Wikipedia* article, edits are continuously changed (e.g. A35_W, A44_W, A74_W). Unsurprisingly, authors not only found the process of editing articles stressful but also judged the quality of the published articles as unsatisfactory. The author quoted below provided a vivid illustration of how frustrating the situation could become at time:

It is not possible to edit the *Wikipedia* article because even for a simple change like a link ... (how on earth is that controversial?) I spent a whole month every night trying to argue the case and find out what exactly was the problem with the link ... and tried to calm the situation down. The truth was that the article was and still is policed by extremist environmentalists who have no intention of letting anyone else edit it and will use every tactic under the sun to stop others even starting to edit (A42_W).

The experience is probably not totally negative as many of the participating authors continue to be highly involved in *Wikipedia*. In fact, there is even some optimism, as illustrated in the quote below:

It is important to note that this section is not up to *Wikipedia* standards yet, but *Wikipedia* is (and will always be) a work in progress, so this is a good step towards how the article will look in the future (A67_w).

Influence from the author

Even when the authors were writing without the intervention of other co-authors, the authors may feel unsatisfied by the quality of the final article, as one author explicitly said (A69_{SAGE}). This is probably because the authors' personality and expertise, as well as their personal stand vis-à-vis the topic of their article influenced their writing and their treatment of SU&C. The quote “I wrote from the viewpoint that I am well acquainted with” (A62_{SAGE}) sums up the approach adopted by many authors. Personal limitations could also greatly affect the quality of the final article, as reported below:

New papers are published on [the topic] all the time, as a result it is difficult to keep up with them all. Furthermore, [the topic] lies outside of my speciality, so I only see a small number of the pertinent publications, and I probably do not understand all that I see. Additionally, when editors who are unfamiliar with the subject see one of these papers, they frequently assume that it needs to be added immediately to the article, when in reality it is only one of a large number (A43_w).

3. Towards an understanding of encyclopaedia authority in general

In general, the roles of encyclopaedias –as indicated by the authors' goal for writing encyclopaedia articles– reflect the roles expected in any authoritative text as defined in Chapter 1.⁶² In particular, the majority of the encyclopaedia authors seemed dedicated to the communication of both knowledge and information. A lot of effort is dedicated to ensure that the readers understand the knowledge and information conveyed. For instance, the choice of SU&C to include in the encyclopaedia article is often based on what is needed for an effective communication. Similarly, many of the writing strategies adopted by the authors are targeted towards avoiding confusion –whereby ensuring that the readers readily identify the presence of SU&C within the articles. In fact,

⁶² See Chapter 1, Section 2 on p.19

considering the effort dedicated to the communication of SU&C, it can also be argued that there is a widespread recognition of the importance of encyclopaedias as not only a source of facts but also advice and opinions in times of uncertainty and controversy.

Seeing that some of the authors expected their readers to not rely solely on encyclopaedias but to also look for additional information elsewhere, one may question whether encyclopaedias fail in one of the most basic criteria used for them to be recognised as cognitive authorities. Indeed, it is reported in Chapter 2 that a text is authoritative only if it provides the information needed. I would argue that the response to the question depends on the definition of encyclopaedias. As long as the goal of encyclopaedias is considered to provide “just a snapshot of knowledge” –as one author defines them (A58_{SAGE})– then, it is totally acceptable for the reader to look elsewhere for more in-depth knowledge. In fact, despite the public’s widespread expectation that “encyclopaedias know all”, standards in modern encyclopaedias –as defined in Chapter 1– allow encyclopaedia authors to only provide background information within encyclopaedia article and to refer the readers to external sources for more in-depth knowledge.

Regarding the communication of scientific knowledge in particular, one of the hypotheses posited in Chapter 1 was that the way in which information is communicated could contribute to the establishment of cognitive authority.⁶³ The current chapter indicates that encyclopaedia authors emphasised the need to “stick to the facts” and to use a neutral style of writing. Even the authors who admittedly wanted to influence the opinion of the readers abided to the same style. A few authors even reported intentionally refraining from using some of the rhetorical devices used by politicians to convince the reader as well as avoiding the heated tone pervasive in the public debate on GW&CC. I would therefore argue that the authority of encyclopaedias seems to be based on the respect of the rules of scientific writing. This is possibly an indirect way of

⁶³ See Chapter 1, Section 2 on p.19

demonstrating that encyclopaedias are serious texts which speak “in the name of science”.⁶⁴

This last point made me wonder to what extent compliance to scientific standards in general –not only the writing and other presentation styles but also the topic coverage and subject treatment– is important in the context of encyclopaedias. A few authors who participated in this survey expressed dissatisfaction regarding the quality of their articles. It is, of course, possible that these are complaints from overly critical perfectionist authors or from biased authors who were frustrated by their experience with writing the article. But it is also possible that there may be real issues with the quality of the articles –in which case, quality as basis for encyclopaedia authority may be questioned. The various parameters used to define encyclopaedia quality as well as the actual quality of published encyclopaedias are at the heart of the next chapter.

⁶⁴ See Chapter 1, Section 3.2 regarding the basis of authority according to Bocheński on p.24

CHAPTER 9.

ENCYCLOPAEDIA QUALITY

The last study of encyclopaedia authority is closely linked with the discussion of the concept of quality provided in Chapter 2. The current chapter focuses on the quality 21st century encyclopaedias and attempts to: (1) identify the key parameters used to determine encyclopaedia quality, particularly in the context of book review; and (2) advance the discussion regarding the link between the concepts of quality and authority, including the process whereby quality in encyclopaedias could lead to recommendations from book reviewers.

The current chapter summarises the results of a content analysis of book reviews which appeared in scientific journals within the ScienceDirect database and which were pertaining to science and technology encyclopaedias published between the years 2000 and 2010 (The methodology adopted is detailed in Chapter 3).⁶⁵ The chapter starts by introducing the study: the reviews, the reviewers and the encyclopaedias reviewed. The chapter then investigates how the process of quality assessment described in Chapter 2 is actually conducted in the context of book reviews before summarising the reviewers' verdicts regarding the quality of the science and technology encyclopaedias under review.

1. Introduction to the study

1.1. Book reviews

As of 31st March 2011, the ScienceDirect database had 784 book reviews with the words 'encyclopaedia' or 'encyclopedia' in the title. Of these, only those

⁶⁵ See Chapter 3, Section 3.3 on p.81

pertaining to science and technology encyclopaedias and published between the years 2000 and 2010 were considered for content analysis (full list provided in Appendix 4). The sample was made up of 80 reviews which came from a total of 56 journals. The length of a review varied from one paragraph to ten pages. Among the shortest reviews were the ones from the journal *Materials Today*. For example, below is all that an anonymous reviewer wrote about the *Encyclopaedia of Energy*:

Contributions from over 400 authors provide a reference on current thinking and practice in the energy sector, as well as related environmental fields. It serves as a resource for students and researchers, as well as a guide for policy makers, consultants, and those working in business corporations and nongovernmental organizations (Anonymous 2004).

Each of the reviews from my sample focused on one encyclopaedia title only. The content of a couple of reviews were slightly atypical in that they went beyond describing and assessing the quality of the encyclopaedia. For example, in the review of the *Encyclopedia of Geomorphology*, the reviewer (Butler 2007) had a few paragraphs about that encyclopaedia, mixed with lengthy discussion of many other books. Similarly, in the review of *The Encyclopedia of Life*, the reviewer (Wilson 2003) dedicated a large part of his article to explain the context which led to the creation of that encyclopaedia as well as the challenges for the encyclopaedia's future development.

1.2. Book reviewers

Generally, the reviewers provided their name at the end of their review (n=73 reviews). In the seven cases where the reviews were left unsigned, one of the two following scenarios might have happened. It is possible that the editorial policy within the journal where the review was published required the reviews to be conducted anonymously. This might have been the case for the journal *Focus on Catalysts* where neither of the two reviews from my sample was signed. But it is also possible that the anonymity was not the result of any journal policy, rather the decision of the reviewers themselves. Such flexibility was apparent in the example of the *Journal of Clinical Forensic Medicine* and in *Trends in Analytical Chemistry* where some reviews were signed whereas others were not.

As many as 61 out of the 73 signed reviews were written by one reviewer only. Ten other reviews had two reviewers. Only two reviews had more than two authors: the review on the *Encyclopedia of Atmospheric Sciences* with four reviewers, and the review on the *Encyclopedia of Southern Appalachian Forest Ecosystems* with seven reviewers. Very few reviewers were involved in the review of more than one encyclopaedia. Those who did were usually looking at encyclopaedias pertaining to closely related topics. For example, Hartemink reviewed the *Encyclopedia of Soil Science* and the *Encyclopedia of Soils in the Environment*. A couple of reviewers were writing separate reviews for different volumes of the same encyclopaedia. That was the case for Berg who wrote separate reviews for the Volume 6 and the Volume 9 of the *Encyclopedia of Electrochemistry*.

Limited information was provided on how the reviewers got involved in the task of reviewing encyclopaedias in the first place. A handful of the reviewers indicated that they had been personally approached by the book review editors from the journals (e.g. Lawler 2002, Anonymous 2003). Other reviewers seemed to be conducting book reviews for specific journals at regular intervals. Among the most prolific reviewer within my sample was Garry Bennet who wrote at least three reviews for the *Journal of Hazardous Materials* in the year 2006 alone. John Kennedy is another prolific reviewer with at least six reviews for the journal *Carbohydrate Polymers* between the years 2002 to 2007.

It may be fair to expect that only an individual with an appropriate level of expertise but who has no conflict of interests with the encyclopaedia authors would be considered as a book reviewer. Fulfilling these conditions, however, sometimes seemed difficult. In fact, some review editors admitted that they encountered difficulties in finding appropriate reviewers and in convincing them to conduct the reviews. Every now and then, compromises had to be considered, as seen in the following example:

After a review copy of the “*Encyclopedia of Soil Science*” was received, I realised it would be difficult to find a reviewer given the size of the book: it is fat (73 mm thick), weighs 3.3 kg and has almost 1500 pages. Secondly, there are so many people involved in this encyclopaedia that it would be difficult to find someone who has not contributed. Therefore, as a non-contributor and someone who likes to read a bit, I decided to review the book myself (Hartemink 2003).

In general, I did not notice any major issue with the choice of reviewers; except, maybe, on one occasion. Robert Fisher was the reviewer for the second edition of *Epilepsy A to Z: A Concise Encyclopedia*. Fisher was, however, a co-author of the first edition of the same encyclopaedia; therefore, I wondered whether there might have been a conflict of interest.

1.3. Science and Technology encyclopaedias reviewed

The 80 reviews considered focused on 66 encyclopaedias. Two encyclopaedias were reviewed three times: the *Encyclopedia of Dairy Sciences* by Elsevier and the *Anaesthesia and Intensive Care A to Z: An Encyclopaedia of Principles and Practice* by Butterworth Heinemann whereas ten other encyclopaedias were reviewed twice. These 66 encyclopaedias were published by 27 publishers – a third of which were published by Elsevier/Academic Press (n=23 titles) and a quarter by Wiley (n=13 titles). The remaining encyclopaedias were from other well-known publishers located in North America and Europe (e.g. CABI Publishing, Taylor and Francis, Chapman & Hall, Oxford University Press, or Cambridge University Press); although none of these other publishers released more than two titles from my list.

In lieu of a description of these encyclopaedias, it can be said that the reviews were mostly based on printed materials (n=75 reviews) although the reviews sometimes include comments on alternative formats. In three cases, the review focused on CD-ROMs: the *Encyclopedia of Neuroscience* by Elsevier/Academic Press, the *Encyclopaedia Homeopathica* by Archibel SA, and *The Merck Index on CD-ROM: An Encyclopaedia of Chemicals, Drugs and Biologicals* by Chapman & Hall/CRCnetBASE. In two cases, the reviews focused on online encyclopaedias: the *Encyclopedia of Life* (www.eol.org) and the *Encyclopedia of Southern Appalachian Forest Ecosystems* (www.forestencyclopedia.net). Regarding the topic coverage, up to 80 percent of these encyclopaedias were specialised in the following five areas: medicine (18 titles), chemistry (12 titles), earth science and life science (both with 9 titles each), and agriculture (7 titles).

Only eight out of the 66 encyclopaedias reviewed here are included in the analysis of encyclopaedia dissemination provided in Chapter 7. Seven encyclopaedias were listed among the “popular encyclopaedias”:

- *Anaesthesia and Intensive Care A-Z: An Encyclopaedia of Principles and Practice* published by Butterworth Heinemann;
- *Encyclopaedia of Animal Behaviour* by Greenwood Press;
- *Encyclopaedia of Catalysis* by Wiley;
- *Encyclopaedia of Gastroenterology* by Elsevier/Academic Press;
- *Encyclopaedia of Separation Science* by Elsevier/Academic Press;
- *Encyclopaedia of Tidepools and Rocky Shores* by University of California Press; and
- *Epilepsy A to Z: A Concise Encyclopaedia* by Demos Medical.

Although the eighth encyclopaedia –the *Encyclopaedia of Medical Imaging* by NICER Institute– fell within the “less popular” group, it still reached up to ten countries.

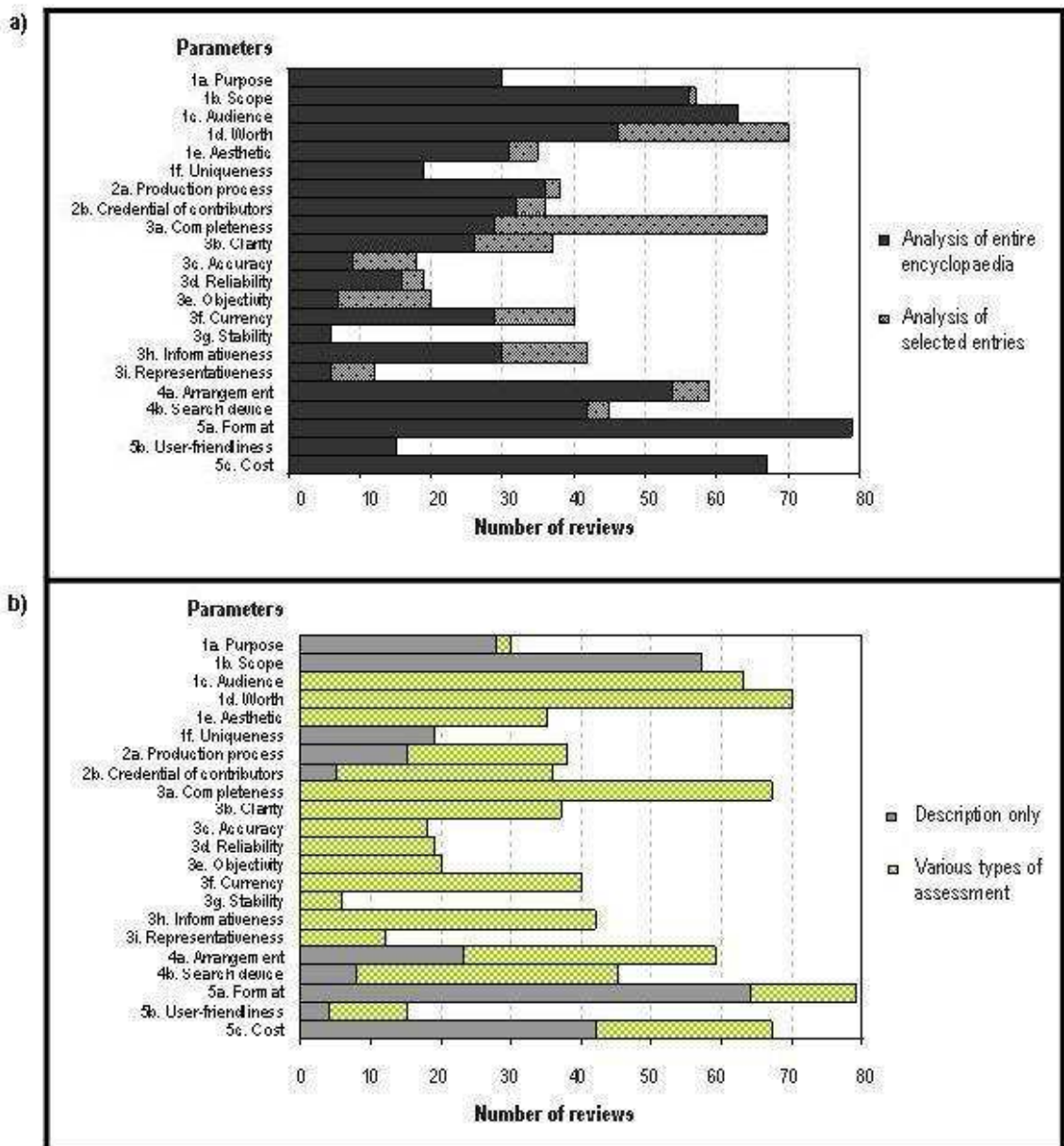
2. Reviewers’ approach to quality assessment

2.1. Challenges encountered

There seemed to be two major challenges which may have influenced the way in which quality assessment was conducted in book reviews on encyclopaedias:

- Comprehensiveness of the review; and
- Objectivity of the review.

Regarding the comprehensiveness of the review, the challenges lie on many fronts. For instance, many but not all reviewers managed to review the entire encyclopaedia (Figure 32a). One reviewer explains that “the amount of material was overwhelming” (Bennett 2006a) and that one is only able to “briefly glance at every page” (Bennett 2006b). Other reviewers admitted that they only managed to review part of the encyclopaedia –either the articles which fell within their areas of expertise (e.g. Lawler 2002, Barrett and Henzi 2005) or the articles which cover less familiar topics (e.g. Kettle 2001, Lord 2006).



Figures constructed from 80 encyclopaedia reviews published between 2000 and 2010 in ScienceDirect

Figure 32. Reviewers' approach to quality assessment

Beyond the challenge imposed by the volume of the material, there was also the challenge imposed by the breadth of the topic coverage. It actually seems a paradox that one or two experts were asked to judge the quality of a work which was supposed to sum-up the “world’s knowledge”. But regardless of the reviewers’ levels of expertise, there would always be relatively vast areas which would escape the reviewers’ scrutiny. So, the quality of these sections not assessed would remain questionable; as indicated in the following quote:

I have some misgivings about the historical and technical correctness of a few of the entries... [The reviewers dedicated several paragraph discussing specific entries] I could go on but this gives a flavour of the problems. And these are the topics that I

know something about. How many errors arise in other topics with which I am not familiar? (Williams 2001).

Assessing specific sections and making extrapolations to the entire encyclopaedia was not always possible because of disparities within such highly collaborative works. There were many cases where the reviewers had to write mixed comments on the various parameters, sometimes even failing to clearly state whether they recommended the encyclopaedia or not.

To remain totally objective while conducting a review also sometimes appeared to be a challenge. It was not always easy for the reviewers to make negative comments. Indeed, the act of writing a review might have unexpected or unwanted consequences, such as the fear of jeopardising professional relationships as indicated in the following quote:

I must confess to feeling more than a little intimidated by being asked to review this book (...) I'm hard pressed to think of a marine mammal biologist of note who has not contributed to the book. A poor review of the book risks offending every researcher with whom I may wish to work in the future (Lawler 2002).

Maybe as an attempt to sound objective, many reviewers tried to provide highly descriptive comments before providing value-judgment about the encyclopaedia (Figure 32b). In fact, the reviewers seemed to give general a description of the encyclopaedia only when parameters pertaining to the importance of the encyclopaedia (Category 1) or those pertaining to the encyclopaedia delivery (Category 5) were considered.

2.2. Use of the various parameters for quality assessment

On average, the reviewers considered four out of the five categories of parameters recommended in Chapter 2. They mentioned all five categories in 48 out of the 80 reviews, four categories in 23 reviews, three categories in five reviews, two categories in three reviews and a single category in only one review. All but one out of the 80 reviews discussed the general importance of the encyclopaedia (Category 1) and the encyclopaedia delivery (Category 5) – a fact which could indicate the high importance allocated to the parameters within these two categories. The parameters pertaining to the encyclopaedia content (Category 3) were the next most commonly discussed as they were mentioned in 75 reviews; followed by the parameters pertaining to information

retrieval (Category 4) which were mentioned in 68 reviews; and finally the ones on encyclopaedia production (Category 2) which were mentioned in 51 reviews.

None of the reviews from my sample mentioned all 22 parameters. On average, a review covered 11 parameters. The review written by Hartemink (2006) on the *Encyclopedia of Soils in the Environment* was the most comprehensive (n=20 parameters). By contrast, three reviews addressed only two parameters each.

The most common parameter mentioned by reviewers was on the encyclopaedia *format* (n=79 reviews) whereas the least common ones were on the *stability of the information* provided (n=6 reviews) and on the *representativeness of that information* (n=12 reviews). The frequency of the use of various parameters within each category is summarised below whereas the reviewers' expectations on each of these parameters are detailed in Appendix 3.

Category 1. Importance within the publishing industry

Among the first points that reviewers commented on pertained to the *worth* and *scope* of the encyclopaedia (n=70 and n=57 reviews respectively) and to the *targeted audience* (n=63 reviews). Few reviewers commented on the *actual purpose of the work* (n=30 reviews) or on its *aesthetic value* (n=35 reviews). Even fewer reviewers made the effort of highlighting the unique aspects which made the encyclopaedia stand out from other titles already published (n=19 reviews).

The reviewers tended to provide descriptive comments when they discussed the *purpose*, *scope* and *uniqueness* of the encyclopaedia (Figure 32b on p.210). For the other parameters within Category 1, the reviewers also tried to add evaluative comments. In particular, they discussed the extent to which a particular encyclopaedia was appropriate to the *target audience*, the usefulness (*worth*) for that audience, as well as the *aesthetic value* of that encyclopaedia.

Category 2. Encyclopaedia production

The reviewers talked about both the *encyclopaedia production process* (n=38 reviews) and the *credentials of the contributors* (n=36 reviews) (Figure 32b on p.210). In the first case, the reviewers typically checked the number of authors

and editors involved (n=28 reviews) and the diversity of these with consideration to their domain of expertise and country of origin (n=17 reviews). Then, the reviewers discussed the amount of effort that the authors and editors had invested in producing the encyclopaedia (n=20 reviews).

Although the reviewers generally started their discussion with descriptive comments on these two parameters, there were some forms of assessment in most of the comments made (as seen in 23 out of the 38 reviews with comments on the *production process* and in 31 out of 36 reviews with comments on the *credentials of the contributors*).

Category 3. Encyclopaedia content

The majority of the reviewers who considered this category of parameters focused on the text within the encyclopaedia articles (n=73 reviews). Additionally, comments on the illustrations were also made (n=34 reviews), as well as on the references and bibliographic lists (n=35 reviews) or on the glossaries (n=6 reviews). Unlike the parameters from the two previous categories, none of the comments on the encyclopaedia content were purely descriptive. Instead, reviewers always tried to highlight existing achievements and shortcomings.

None of the reviewers who wrote about the encyclopaedia texts considered all nine parameters within Category 3. The review with the highest number of parameters was, once again, that written by Hartemink on the *Encyclopedia of Soils in the Environment* - a review which covered all parameters except the one on the *reliability* of the text. More generally, the reviewers looked into three parameters on average. The most common comments were pertaining to the *completeness* of the content of the encyclopaedia texts (n=65 reviews) followed by comments on the *currency* (n=37 reviews), the *clarity* (n=35 reviews), the *informativeness* (n=21 reviews), the *objectivity* (n=19 reviews), the *accuracy* (n=16 reviews), the *reliability* (n=11 reviews), the *representativeness* (n=10 reviews) and finally the *stability* of the text (n=6 reviews).

The order of importance of the various parameters seemed to be different from what was just described above when the reviewers were writing about the

illustrations within the encyclopaedia. Indeed, it was the *informativeness* of the illustrations which was the most commented on (n=24 reviews), followed by their *completeness* (n=13 reviews), their *clarity* (n=5 reviews), their *accuracy* (n=3 reviews) and finally, their *reliability* (n=1 review). The remaining four parameters from Category 3 were probably not seen as pertinent to the encyclopaedia illustrations as they were not mentioned in the reviews from my sample.

Regarding the comments on the references and bibliographic lists, reviewers were actually using them as a way of assessing the *reliability* of the information provided in the text. Sometimes, comments were also made on the *currency* of these references and bibliographic lists (n=4 reviews), on their *informativeness* –i.e. to which extent they allowed the reader to gather more information on the topics covered within the encyclopaedia (n=13 reviews). A couple of reviewers also criticised the way how referring standards were used by encyclopaedia authors –an aspect of quality which, in the Chapter 2, falls under *representativeness* of the content.

Finally, regarding the comments on the encyclopaedia glossaries, only their *informativeness* and *completeness* were discussed in the reviews. The former type of comment was seen in four reviews whereas the latter one was seen in two reviews only.

Category 4. Information retrieval

Reviewers made comments about the *arrangement* of the articles within the encyclopaedia in 59 reviews and about the existing *search devices* in 45 reviews (Figure 32b on p.210). In this second case in particular, there were comments on the encyclopaedia table of contents and index in 25 reviews. A similar number of reviews had comments on the use of cross-references and hyperlinks within encyclopaedias. Finally, reviewers commented on the search engine in use for electronic and online encyclopaedias in 11 instances.

Regarding the type of comments made on each parameter, the reviewers just described the *arrangement* of the articles in 23 reviews. They, however, evaluated the extent to which such *arrangement* could be conducive to a quick

retrieval of the information needed by the encyclopaedia users in 32 reviews. On the other hand, instead of just describing the existing *search devices*, the reviewers generally insisted on evaluating the effectiveness of these search devices in assisting the encyclopaedia users to locate the information needed (n=23 out of the 45 reviews with comments on *search device*).

Category 5. Encyclopaedia delivery

Within this category, 79 reviews had comments on the *format of delivery* (printed, electronic, or online), and 67 on the *cost of the encyclopaedia*. Only 15 reviews had comments on the *user-friendliness of the delivery*.

In general, the comments were made on the actual delivery format of the encyclopaedias, either in print, or in electronic and online format. In seven cases, however, the reviewers also gave suggestions on alternative formats which were to be developed. See, for example, the two excerpts below:

If the authors can be persuaded to commit to updating this book regularly and if the publishers can be persuaded to make it available via CD-ROM or internet, then *Anaesthesia and Intensive Care A to Z* will no longer be modern medicine's best kept secret (Tang 2000);

or

[I am] concerned about how the wealth of knowledge provided in the *Encyclopedia [of Virology]* can be maximally used. An electronic version with a powerful search program should be considered for the next edition (Desselberger 2009).

As in many of the parameters discussed in other categories, some reviewers just described the encyclopaedia delivery whereas others added their opinions on the appropriateness of these delivery modes.

3. Reviewers' verdict on the quality of science and technology encyclopaedias

3.1. Comments made on the various parameters

In some of the parameters used in quality assessment, the reviewers limited themselves to descriptive comments whereas in others, they added some value judgments. In this later case, the comments made by the reviewers fell in one of the following group:

- Positive comments;

- Negative comments; or
- Comments with a mixture of positive and negative points, or comments with suggestions for improvement.

The distribution of these different types of comment varied widely for each of the parameters for quality assessment (Figure 33). A summary of the reviewers' criticisms –i.e. the negative and mixed comments made on each parameters– is provided in Appendix 3.

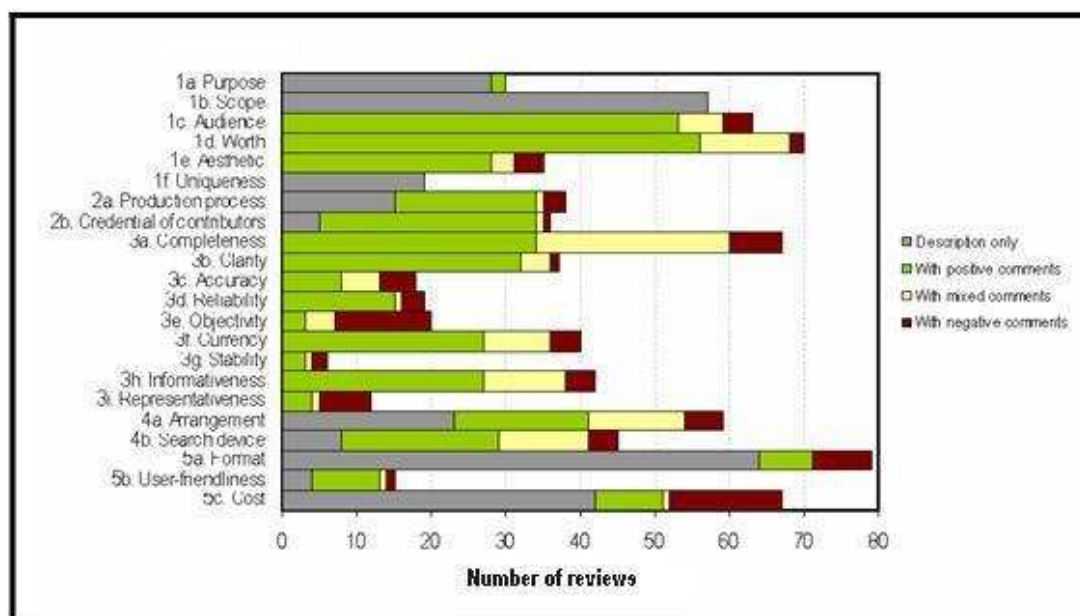


Figure constructed from 80 encyclopaedia reviews published between 2000 and 2010 in ScienceDirect

Figure 33. Types of comment made by the reviewers

For the parameters where the reviewers made value judgments, the number of positive comments was often higher than the number of negative and mixed comments combined. Positive comments were, however, not always predominant. That was the case in the three parameters pertaining to the encyclopaedia content below. In particular, in the 18 reviews where the reviewers commented on the *accuracy of the content*, the positive comments were seen in 8 reviews, compared to 5 reviews with mixed comments and 5 reviews with negative ones. Similarly, in the 20 reviews where the reviewers commented on the *objectivity of the content*, the positive comments were seen in 3 reviews, compared to 4 reviews with mixed comments and 13 reviews with negative ones. Finally, in the 12 reviews where the reviewers commented on the *representativeness of the content*, the positive comments were seen in 4

reviews, compared to 1 review with mixed comments and 7 reviews with negative ones.

The numbers of positive reviews were also relatively low when it came to the comments regarding the *delivery format* and the *cost* of the encyclopaedias. Indeed, in the 15 reviews where the reviewers made evaluative comments on the *format of delivery*, positive comments were seen in 7 reviews whereas negative comments were seen in 8; whereas, in the 25 reviews where the reviewers made evaluative comments on the *cost of the encyclopaedia*, there were positive comments in 9 reviews, compared to 1 review with mixed comments and 15 reviews with negative comments.

3.2. Comments made on the encyclopaedias

In the conclusion section of their reviews, the majority of the reviewers also tried to assess the quality of the encyclopaedias as a whole before deciding to recommend the encyclopaedias to other users or not (Figure 34).

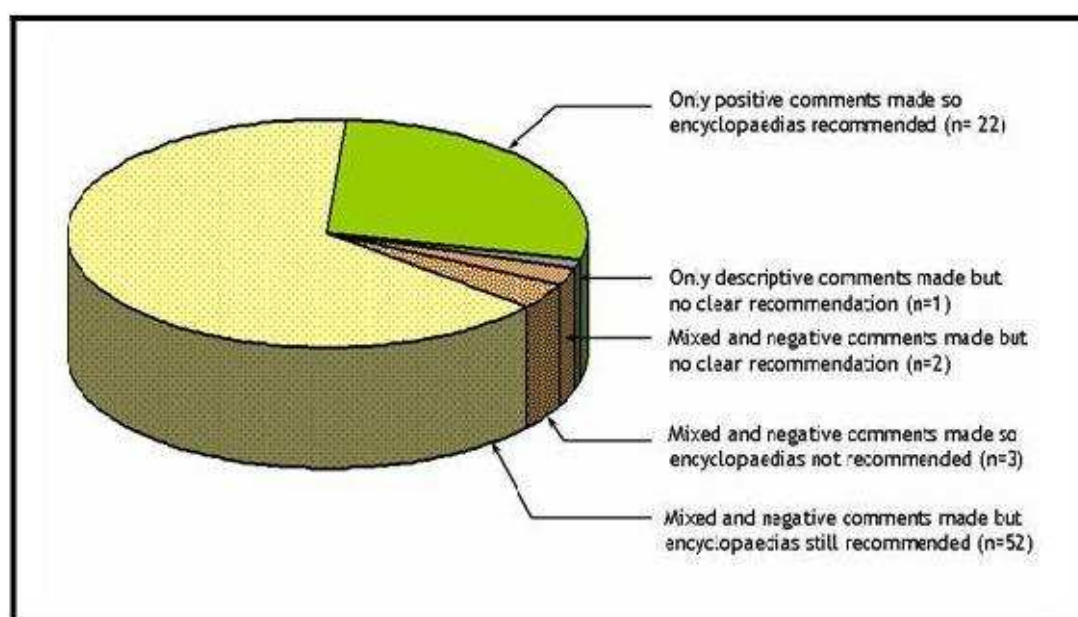


Figure constructed from 80 encyclopaedia reviews published between 2000 and 2010 in ScienceDirect

Figure 34. Recommendations regarding science and technology encyclopaedias

In the majority of the cases (n=74 out of 80 reviews), the reviewers recommended the encyclopaedias to potential buyers. Among these reviews, only 22 cases were made up of all positive comments. By contrast, in 52 cases,

the reviewers made positive comments along with mixed and negative ones. They, nevertheless, decided that the general quality of the encyclopaedia was satisfactory to the extent that they still clearly recommended the volume to others users, as illustrated in the following example:

To the readers, enjoy this encyclopedia, because despite some of my comments I believe it is a valuable resource (Anonymous reviewer on the Encyclopedia of Atmospheric Sciences)

In three out of the 80 reviews, the reviewers did not make clear recommendations. In the two-sentence review that was written about *The Concise Encyclopedia of the Properties of Materials Surfaces and Interfaces* (reviewed by Martin 2008), there were only brief descriptive comments of the scope of the encyclopaedia. In the case of the *Encyclopedia of Biodiversity* (reviewed by Kareiva 2001) as well as in the case of Volume 9 from the *Encyclopedia of Electrochemistry* (reviewed by Berg 2003) the reviewers made a mix of positive and negative comments but they let the reader decide whether these encyclopaedias were worth purchasing or not.

Finally, there were three reviews out of the 80 considered in this study where the reviewers had a mix of positive and negative comments, but, at the end, rebuffed the encyclopaedia in unequivocal terms. More specifically, it was written on the *Encyclopedia of Global Environmental Change* that

... the coverage of topics is too uneven and the quality rather too variable. It is the organization of the material and the indexing that lets the project down so badly. Normally, I would be willing to be more forgiving, but not at this price (Watkinson 2003).

on the *Encyclopaedia of Animal Behaviour*:

As a compilation, though, the uneven and often indiscriminating coverage of the field, combined with the high cover price (£200.00), make us reluctant to recommend this book as essential for either the library or for personal use (Barrett and Henzi 2005);

on the *Chemical Engineer's Condensed Encyclopedia of Process Equipment*:

This book does not even deserve browsing (van der Meijden 2001).

In the ten cases where the encyclopaedias were discussed in more than one review, the reviewers ended up with similar verdicts, even if they may have checked different parameters. In eight cases, mixed and negative comments were made regarding some of the parameters but the encyclopaedia as a whole

was still recommended by all reviewers. In the case of the *Encyclopedia of Dairy Sciences* by Elsevier, one review (Kennedy and Bandaiphet 2003) only had positive comments whereas the two other reviews (Haenlein 2004, Zehntner 2004) had mixed and negative comments; but, once again, the encyclopaedia was recommended by all. Finally, in the case of the *Encyclopedia of Energy* by Elsevier, both reviews (Anonymous 2004, Todorovic 2006) highly recommended the encyclopaedias and the reviewers only wrote positive comments.

3.3. Quality of the science and technology encyclopaedias recommended by reviewers

It is clear from this chapter that encyclopaedias commonly have shortcomings. However, many of these shortcomings were dismissed to the extent that the reviewers still recommended the encyclopaedias to potential buyers and users. Indeed, when the reviewers had mixed and negative comments, it was not rare that the importance of the latter was clearly downplayed using various strategies. For example, the anonymous reviewer who looked at the *Encyclopedia of Atmospheric Sciences* told the reader that his negative comments could be ignored. Other reviewers surrounded their negative comments with positive ones, an approach which might have been intended to diffuse any criticism expressed. Many reviewers also adopted a subdued/neutral tone when making negative comments but used strong adjectives and highly appraisal language when making positive comments. A couple of reviewers even presented their criticisms with a hint of humour, as in the quote below:

Also, there was talk that the oxygen flush could be locked-on to permit ventilation by lifting the mask off the patient's face. (Budgets must be tight if the authors' departments still have anaesthetic machines where the flush can be locked-on!) (Greenslade 2000);

In addition, one reviewer emphasised the fact that his views may be tinted by personal bias, implying thereby that other people may have different opinions:

But these are minor points and reflect to some extent my own personal interests and preferences (Emery 2003).

Even in the cases where the encyclopaedia received positive comments only, it is clear that some of the reviewers simply decided not to mention any of the weaknesses they might have noticed. One of the potential explanations was that

these reviewers were impressed by the general quality of the encyclopaedias and only wanted to express their praise, as one reviewer admitted:

To be honest, I did manage to compile a very, very short list of 'things to complain about', but I do not want to mention them here as this would be highly inappropriate compared to the superb quality of the book these editors and authors have succeeded in offering us! (Sapidis 2005).

3.4. Quality of the science and technology encyclopaedias not recommended by reviewers

This section summarises the comments made by reviewers for the three encyclopaedias which were not recommended to potential buyers and users:

- *The Encyclopedia of Global Environmental Change*;
- *The Encyclopaedia of Animal Behaviour*; and
- *The Chemical Engineer's Condensed Encyclopedia of Process Equipment*.

3.4.a. The *Encyclopedia of Global Environmental Change*

The reviewer commented on the *purpose* and *worth* of the encyclopaedia, on the *credentials* of the contributors, and on various aspects of the encyclopaedia content (*completeness, representativeness, objectivity*), on the information retrieval (*arrangement* and *search engine*), and encyclopaedia delivery (particularly on the *cost* of the set).

As a positive comment, the reviewer wrote:

Given the distinguished nature of some of the contributors to this encyclopedia, it would be surprising if there were not some excellent articles (Watkinson 2003);

and he dedicated a large part of the review to describe the scope of the content and to highlight the value of the specific sections, particularly Volume 4 on *Responding to Global Environmental Change* and Volume 5 on *Social and Economic Dimensions of Global Environmental Change*.

In contrast, the reviewers identified various failures in the encyclopaedia content. For example, the topic coverage was considered too uneven and some gaps had been identified. The reviewer also wrote a relatively long paragraph describing the system used for information retrieval and ruthlessly criticized the effectiveness of the index, reflecting on his own experience trying to find

specific information through the encyclopaedia. In fact, the reviewer's conclusion was that

It is the organization of the material and the indexing that lets the project down so badly (Watkinson 2003).

This reviewer ended his review by adding:

Normally, I would be willing to be more forgiving, but not at this price (Watkinson 2003);

and claimed that, even for the parts of the encyclopaedias which were considered of high quality such as the content of Volume 4, the reader could get similar information from cheaper publications from the Internet.

3.4.b. The *Encyclopaedia of Animal Behaviour*

Here, the parameters considered by the reviewers (Barrett and Henzi 2005) were: *Audience, Worth, Aesthetic, Completeness, Reliability, Representativeness, Objectivity, Currency, Format, Cost*. The only positive comment was pertaining to the *Aesthetic* aspect of the encyclopaedia, namely the writing style which was considered very enthusiastic throughout the entire encyclopaedia. On the other hand, there were some mixed comments regarding the *Worth* of the encyclopaedias. Indeed, the reviewers identified some topics of potential interest for the reader but added that the coverage was too uneven. All the other parameters were rated negative.

About the *completeness* of the coverage, there was already an issue of uneven coverage, as indicated in the following excerpt:

the lack of balance is perhaps the most worrying aspect of this enterprise (...) Some feel for this unbalanced coverage (...) the uneven and often indiscriminating coverage of the field... a coverage of topics and taxa that was very uneven and idiosyncratic (Barrett and Henzi 2005);

and the reviewers often deplored the fact that the authors were emphasizing points which were not deemed important. In fact, the coverage was considered unsuitable to young and general readers which formed the encyclopaedia *Targeted audience*. But there were also some issues with topic overlap and redundancy, as well as some gaps in the content.

About the *Currency* of the encyclopaedia, some of the entries were found out of date, particularly with the articles on bibliography as the encyclopaedia was missing a number of the individuals who have been central to the development of the field at the time of publication. Interestingly, the reviewers also talked about the authors' "old-fashioned" approach to topic coverage. Regarding the entry on "ethogram", for example, the reviewers found the author's "atheoretical emphasis tedious" and added that the "enthusiastic rejection of its formalities makes it an old-fashioned technique to emphasize (Barrett and Henzi 2005).

This encyclopaedia also had issues regarding the *Reliability* of the content of some of its articles:

The article, by Rupert Sheldrake, begins with the statement that 48% of dog owners and 33% of cat owners said that their pets responded to their thoughts. These kinds of 'data' are presented unquestioningly, which seems remiss given the results regularly thrown up by polls and questionnaires of this sort (...) Sheldrake then goes on to run through some of his experiments that, while ruling out certain alternative explanations for telepathic behaviour, do not actually provide any concrete evidence that dogs and cats are telepathic or, indeed how this kind of telepathy is actually supposed to work. Merely stating that 'telepathy seems the only hypothesis that can account for the facts' is not quite good enough" (Barrett and Henzi 2005).

Additionally, the biased coverage and the partial argumentation noticed in some entries affected the *Objectivity* of the encyclopaedia. The reviewers even found instances of self-promotions, as illustrated in the following quotes:

Alyn Brereton, presents his own ideas (the coercion-defence hypothesis) as received wisdom, which is by no means the case, and does not give due credit to other earlier work (or the fact that it is at least as well supported as his pet theory)... (Barrett and Henzi 2005);

and

Lukas Noldus provides an entry on computerized data analysis that, while broad and comprehensive, also manages to be an unabashed sales pitch for the products made by his company... This partiality is reflected in many other entries... (Barrett and Henzi 2005).

There were also negative comments regarding the *Representativeness* of the content, in some of the articles. For example, talking about a section on careers in animal behaviour, the reviewer wrote: "This is a topic rarely covered by

standard texts”. Representativeness was also an issue at the level of the entire encyclopaedia:

the world of animal behaviour we encountered in these pages was not one we found very familiar or in which we necessarily felt at home (...) with an inordinate amount of discussion concerning the mental lives of animals (what it is like to be a dog, cat, kangaroo or chimpanzee), rather than animal behaviour per se; that is, what they actually do and why (Barrett and Henzi 2005).

Finally, the *Cost* of the encyclopaedia was considered too high for the quality of the final product.

3.4.c. The *Chemical Engineer's Condensed Encyclopedia of Process Equipment*

This case stood out by the fact that the review consists mostly of mixed or negative comment. In addition, there was a lot of emphasis on the illustrations. From an *aesthetic* point of view, the illustrations were considered of “unbelievably low quality”. The illustrations also failed to contribute to the *informativeness* of the content as they “contain so much detailed information in a small picture that they are unreadable”. Additionally, the way in which the illustrations had been reproduced for the encyclopaedia made them highly affected their *accuracy*:

a lot of illustrations have apparently been picked from other publications and have been adapted in size and/or form to fit the space. This has led to distorted equipment (ellipses instead of circles) and gives the impression that process equipment is full of ellipsoidal rotors, pulleys, vessels, etc. (van der Meijden 2001).

Some of the illustrations even gave contradicting information, as the reviewer discovered in some entries:

some illustrations are really misleading. The typical operating scheme of a centrifugal pump, showing a pump with a suction line extending into a pit below the pump is an example of this (It suggests that centrifugal pumps would be selfpriming; the text explains that that is not the case) (van der Meijden 2001).

In fact, the reviewer reported that the low quality of the illustrations was enough to condemn the entire encyclopaedia upfront:

After receiving this book for review I started browsing through it and that gave me an as yet unidentified bad feeling. Then I started reading some entries on equipment I had been working with during the last few years. I read the entries on cooling towers, on pumps, on extruders, on distillation, on compressors, just to mention a few and the bad feeling did not disappear (van der Meijden 2001).

But the reviewer did not limit his analysis to the illustrations. He also had many negative criticisms regarding the text itself, the references, the arrangements of the articles and the cross-referencing. The information provided was considered incomplete, as explained below:

most of the text is used to explain how a piece of equipment works in such a general way, without dealing with the principles that govern its performance... Furthermore, the entries are rather incomplete about types of equipment within a category. For example, structured packings are not mentioned at all, neither under distillation nor under absorption (van der Meijden 2001).

Also, “References are generally lacking and most of the referenced literature is rather old” which makes one wonder about the *reliability* of the content provided. Finally, the reviewer complained that the “cross-references between entries are lacking and, even worse, analogies between processes are not mentioned”. Also, he did not like the *arrangement* of the entries, probably because the system is uncommon for an encyclopaedia. He explained:

The equipment is listed alphabetically, which could make it easy to find, if only the listing had been on the main equipment name. Unfortunately, this book does it on the adjective! For example, Twin Screw Extruders are found under T, while under the heading Extruders (under E) there is no reference to the existence of Twin Screw Extruders (van der Meijden 2001).

4. Link between quality assessment and final verdict

It appears that no single parameter played more a determinant role than the others in defining the reviewers' final verdicts. Considering the general indulgence that reviewers tended to express towards encyclopaedias, it made more sense to try to identify the parameters which would condemn encyclopaedias than the opposite.

There were only two parameters which were simultaneously mentioned in the case of the three encyclopaedias not recommended by the reviewers: *worth* of the encyclopaedia for the target audience and the *completeness* of the encyclopaedia content. These two parameters received negative or mixed comments in all three reviews; yet, it cannot be said that receiving negative or mixed comment on the *worth* or the *completeness* of the content would automatically condemn an encyclopaedia. Indeed, looking at the 74 encyclopaedias which were recommended by the reviewers, 10 were considered of limited worth for their audience and 38 had issue with completeness. More generally, none of the parameters which received mixed comments from the reviewers were limited to the not-recommended encyclopaedias (Figure 35).

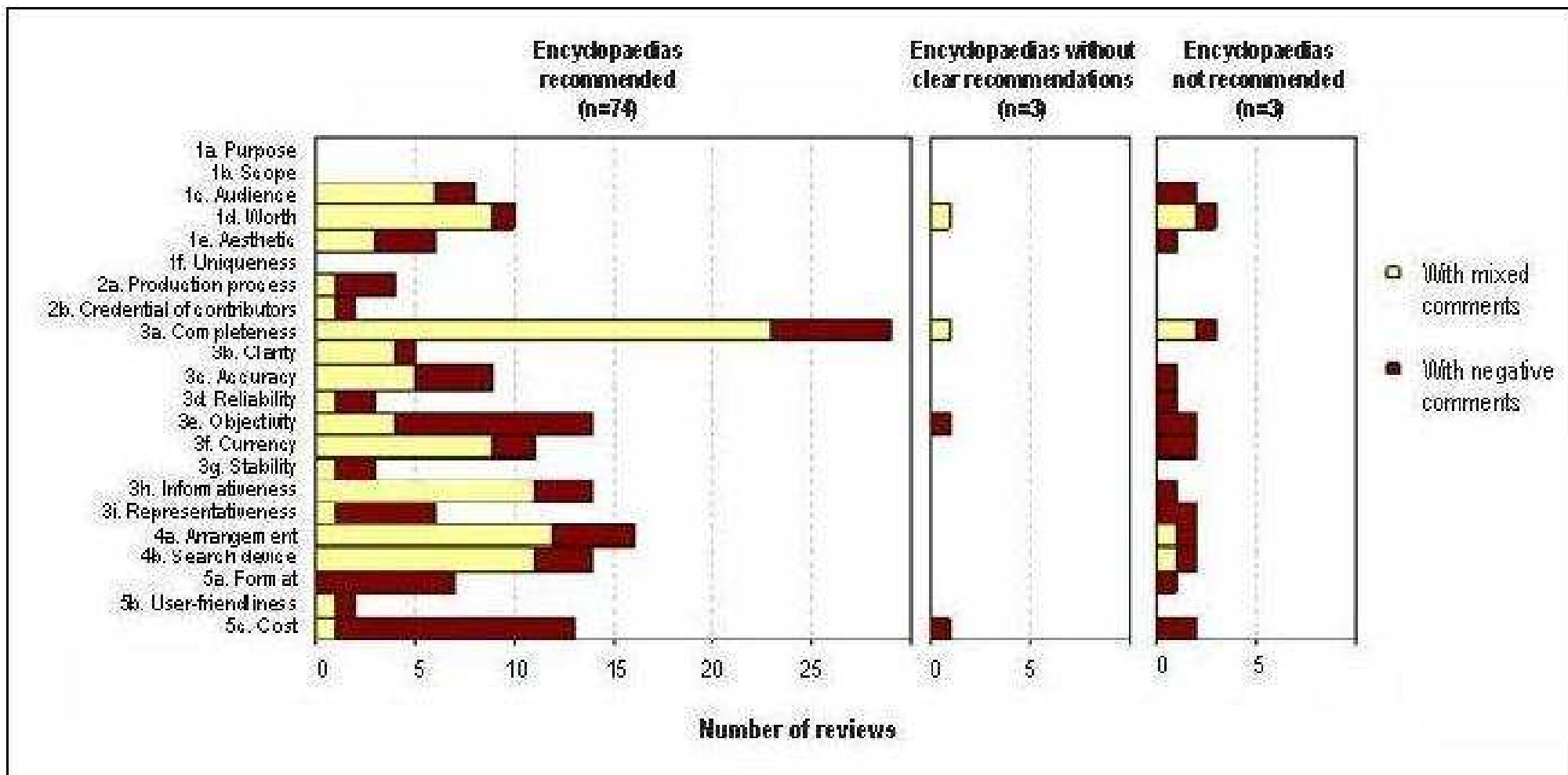


Figure constructed from 80 encyclopaedia reviews published between 2000 and 2010 in ScienceDirect

Figure 35. Recommendations with mixed and negative comments made by the reviewers

It is possible that, within a given review, the ratio between the number of descriptive and positive comments on the one hand and the number of mixed and negative comments on the other hand played an important role in the final recommendations made by the reviewer (Figure 36). In particular, in the 74 cases where the reviewers recommended the encyclopaedias to potential buyers, on average five parameters received positive comments compared to two parameters with mixed comments and two parameters with negative comments. In the three cases where no clear recommendations were made, the reviewers mostly provided descriptive comments and expressed positive, mixed, or negative comment in only one parameter. Also, in each of these three cases, the parameters with mixed and negative comments generally outnumbered the parameters with descriptive and positive comments.

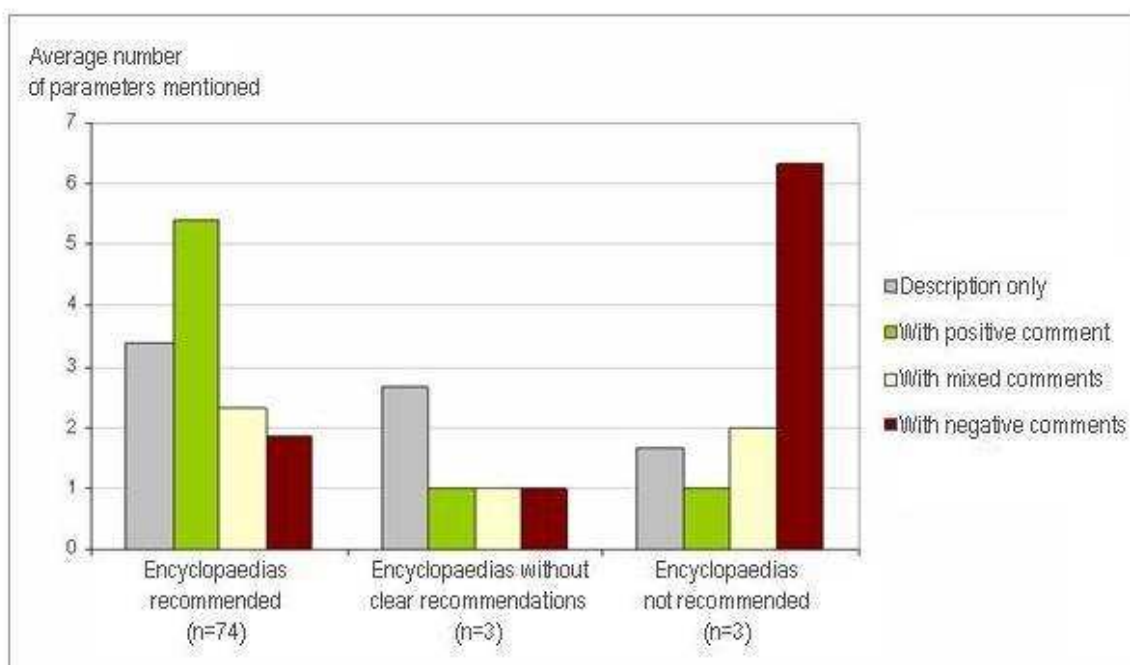


Figure constructed from 80 encyclopaedia reviews published between 2000 and 2010 in ScienceDirect

Figure 36. Recommendations with various types of comment made by the reviewers

Maybe it is impossible to predict the outcome of a review as everything depend on the encyclopaedia and on the style of the reviewer. It was already discussed in the previous chapter⁶⁶ that quality assessment is often subjective. Tendencies could have been analysed if there were more encyclopaedias which were not recommended by the reviewers. Considering that there are only three such

⁶⁶ See Chapter 9, Section 2 regarding the reviewers' approach to quality assessment on p.209

encyclopaedias, the comments that they received was described in Section 3.2 on p.217 in order to illustrate how different they are from one another.

5. Towards an understanding of encyclopaedia authority in general

The current chapter provides some indications of the book reviewers' views on how to define the concept of authority. In particular, this chapter indicates among the 22 parameters listed in Chapter 2, the most commonly mentioned parameters –hence the most important in defining quality and authority– were the ones pertaining to the importance of the encyclopaedia within the industry (Category 1). The reviewers particularly insisted on the profile of the *target audience*, the *worth* and *scope* of the encyclopaedia. The next most important parameters were the ones pertaining to encyclopaedia delivery (Category 5), with the *format of delivery* and the *cost of the encyclopaedia* at the top of the list. Within the parameters pertaining to the quality of the encyclopaedia content (Category 3), the *completeness* of the content attracted an exceptionally high number of comments from reviewers. But some of the parameters from Category 3 were also among the least commented upon; namely, the *stability* and *representativeness* of encyclopaedia content but – more surprisingly– the *accuracy*, *reliability* and *objectivity* of the content.

Focusing on the ten parameters most closely associated with the concept of authority according to the literature from library and information science,⁶⁷ the reviewers mentioned most commonly the *worth* of the encyclopaedia, followed by the *credentials of the contributors* and the effort invested in the encyclopaedia *production process*. The reviewers also gave great attention to the *completeness* and *currency* of the information. But, once again, the *objectivity*, *reliability*, *accuracy*, *representativeness* and *stability* of the encyclopaedia content appeared less important (although it may be possible that these parameters are less easy to assess).

Regarding the reviewers' use of the word 'authority' (or the associated adjective 'authoritative'), only a few occurrences were observed. The word 'authority' was only encountered in five out of the 80 reviews and solely in discussions

⁶⁷ See Chapter 2, Section 4 on p.56

regarding the *encyclopaedia production process* and the *credentials of the encyclopaedia contributors* (Figure 37). In fact, the reviewers typically used the word ‘authority’ to refer to the experts who wrote and compile encyclopaedia articles, as seen in the expression “is an authority” (Loddenkemper and Zarowski 2010), or in “written by authorities” (e.g. Sparkman 2001, Clements 2002, Kennedy and Mistry 2003, Karipot *et al.* 2005). By contrast, the word ‘authoritative’ occurred in six reviews, within the discussions pertaining to the *worth* of encyclopaedias. For example, *The Encyclopedia of Mass Spectrometry* was qualified as an “authoritative volume” (Wilkins 2004) and the *Encyclopedia of Extraordinary Social Behavior* an “authoritative read” (Petrie 2010) whereas the *Encyclopedia of Grain Science* was said to be an “authoritative reference providing (...) authoritative answers to perplexing question” (Kennedy and Jin 2005). I would argue that it was when reviewers used the adjective ‘authoritative’ in reference to the *worth* of a particular encyclopaedia that there was a closest link with the idea of quality in general. In all cases, the reviewers seem to take a narrower understanding of the concept of authority than the librarians and information scientists discussed in Chapter 2.

Additionally, the current chapter practically assesses the authority of sample encyclopaedias. As indicated in earlier chapters of this thesis, authority can be seen in various ways: authority can be linked with the recommendations made by experts,⁶⁸ or authority can also be strongly linked with quality (the two concepts can be considered as equivalent or the concept of authority can be contained within that of authority). From the assessment of the quality of science and technology encyclopaedias and from the analysis of the recommendations made by the book reviewers, the current chapter offers a more pragmatic approach to the study of encyclopaedia authority.

The current chapter indicates that the great majority of the science and technology encyclopaedias reviewed were recommended by the reviewers. Such favourable recommendations play an important role in securing the trust of the potential buyers and users and in ensuring that these encyclopaedias become cognitive authorities for them. But the fact that some of the encyclopaedias reviewed were not recommended by the book reviewers can be interpreted as a

⁶⁸ See Chapter 1, Section 4.2 on p.36

sign that not all encyclopaedias have the potential to become authorities. In other words, the general belief that encyclopaedias are the ultimate authorities –as often reported in earlier chapters⁶⁹– is now challenged. This last point is emphasised by reported shortcomings in the quality of the science and technology encyclopaedias reviewed. Indeed, there were many parameters for which the book reviewers had criticisms (See also Appendix 3).

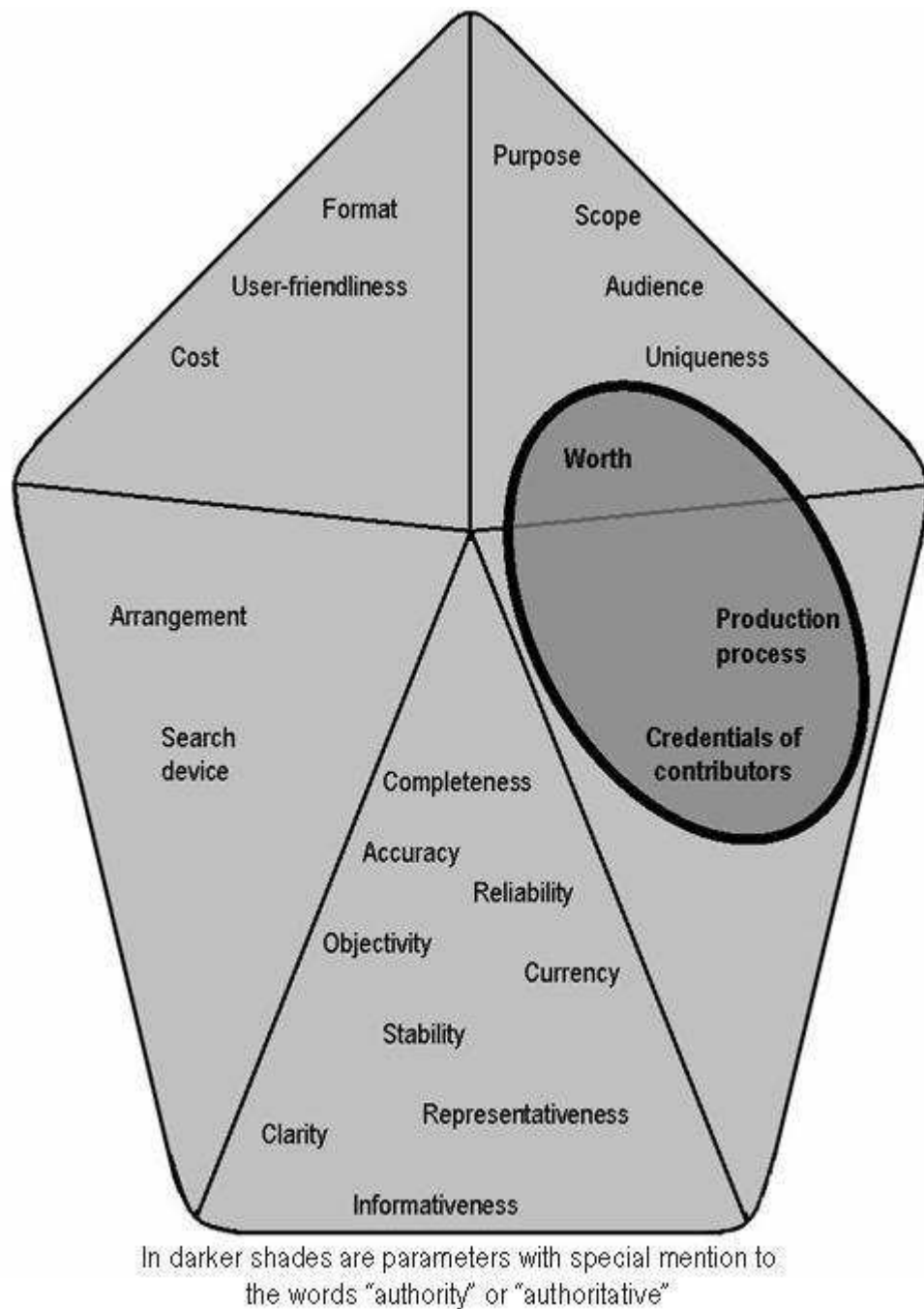


Figure 37. Occurrence of authority within quality assessment in book review

⁶⁹ See the Introductory Chapter on p.1 as well as Chapter 1 and Chapter 4

In light of the analysis provided in this chapter, it appears that it is difficult to predict whether an encyclopaedia would be recommended to the buyers or not. For sure, there was no single parameter which, by itself, would automatically cause the reviewers to grant or withhold their recommendations. The data indicated that, possibly, the higher the number of positive comments, the higher the chance for the reviewers' verdict to be favourable, and vice versa.

CONCLUSION

This thesis was a long exploration of various aspects of encyclopaedias – particularly their authority and quality– but the first noteworthy finding from the thesis concerns the fate of encyclopaedias in the 21st century. Despite the extraordinary popularity of *Wikipedia*, it is unlikely that the traditional encyclopaedias will be supplanted by *Wikipedia* in the near future. They will probably increase their presence online but they would not switch into the highly collaborative user-generated model which is used in *Wikipedia*. This thesis has demonstrated that, although the size of the industry is relatively small compared to other non-fiction publications, the number of encyclopaedia titles published every year is far from declining. Outside of European and North American countries –which have been leaders in encyclopaedia making for centuries– encyclopaedia publishing even seems to be particularly flourishing in some of the countries with emerging economies like India.

Before discussing the research findings on encyclopaedia authority, I first spend some time reflecting on the theoretical and methodological framework of the thesis. In the Introduction and Methodology Chapter of the thesis, I indicated that the process of researching encyclopaedia authority is comparable with the process of building a kaleidoscope. Here, I return to the same metaphor in order to enliven the reading and to draw the attention of the reader to specific points which otherwise might be lost in the profusion of information provided.

Reflections on the theoretical framework

The first step in kaleidoscope making focuses on the mirrors to use. A mirror is intended to offer a reflection of reality. The quality of this reflection depends on the type of mirror (normal, convex, or distorting mirrors, etc.). In a kaleidoscope, there are at least two mirrors so that light can bounce back and

forth between them along the kaleidoscope tube. The quality and complexity of the final patterns created by the device depend not only on the type of the mirror used but also on the way in which the mirrors are positioned.⁷⁰ Without these mirrors, no complex pattern would appear in the kaleidoscope.

In the context of the research in general, theories play the role of the mirrors in a kaleidoscope. In this particular research, there were two of them: the theory of cognitive authority and the theory of quality. Like mirrors, each theory reflects a facet of encyclopaedias from a particular angle. Together, the two theories interact in a very complex way and offered a new and multi-faceted but much more complex –and somewhat confusing– reflection of the exactly same object. I dedicate the first part of this Conclusion to specify the characteristics of these theories and describe the way they interact with one another.

Starting with the main mirror –the theory of cognitive authority– when a ray of light hits its surface, it bounces in all directions and breaks down the reflection of any object in pieces which are difficult to put together. It is as if the surface of the mirror is not flat but has asperities and angles. Moreover, there seem to be patches where the reflecting agent of the mirror hardly reflects light or does not reflect it at all. In Chapter 1, it is made clear that any discussion on cognitive authority would fork into –at least– two directions. There is the discussion around the people who are the subjects of authority: How they choose their authority? How they justify the reliance to this authority? How they measure authority? Then, there is the discussion around the people who are the bearers of authority: Is there really a superior knowledge justifying the status as cognitive authority? What do the bearers of authority do to the subjects of authority? Chapter 1 also indicates that the same types of discussion occur when the theory of cognitive authority is applied to the case of published texts.

In the same way it would not be fair to expect any mirror to provide a perfect and complete reflection, it would not be fair to expect such a thing from the theory of cognitive authority. To complement my first mirror, a second one was chosen which consists of the theory of quality. This is a special mirror which has prism-like properties. A prism refracts light in such a way that when a ray of

⁷⁰ For instance, two mirrors set at 45° would create 8 duplicates of the object reflected; at 60°, they would create 6 duplicates; and at 90°, they would create 4 duplicates.

light passes through it, the ray which emerges on the other side is split into the various constituents of the light's spectral colours (this is similar to the light being split into 7 colours in the phenomenon of a rainbow). Similarly, when the framework for quality assessment described in Chapter 2 is applied to any publication such as an encyclopaedia, this latter would be broken down into as many as 22 parameters.

Reflections on the methodological framework

The second step of kaleidoscope making focuses on selecting the pieces of glass to use. There are different types of glass; they come in different colours, shapes, thicknesses, etc. It is of course possible to build a kaleidoscope with random assortments of glass. It is even possible to use only one type of glass and still obtain a functioning –albeit rather unexciting because monochrome– device. Ideally, kaleidoscope would be composed of various types of glass which would then be chosen with care. Most manufacturers and kaleidoscope fans are able to make some informed choice based on previous knowledge and experience. There are, however, times when the choice is simply dictated by the availability and price of the various components.

With the understanding that the pieces of glass within the kaleidoscope represent the research methodological framework, it is often the case that the researcher has a wide variety of pieces to choose from. It is possible to make the choice based on the personal preferences of the researcher or based on what is in fashion within the research community at the time. In an ideal world, the researcher would design the research methodology based on informed knowledge of what each method could achieve, and on what would work best with the theoretical framework chosen for the study. Yet, it is not rare that the researcher has to make the choice based on existing practical or financial constraints.

In my case, while trying to research encyclopaedia authority, I defined my methodology according to a combination of various factors. My initial choice was primarily based on both what I knew about the theories of cognitive authority and quality and on what I enjoyed doing. The final choice of methodology was, however, the result of a series of trial-and-error processes and was dictated by

what was possible and what was not possible in the context of this PhD. One part of the methodology was about taking advantage of previous research and trying to reinterpret existing findings so that they fitted my purpose and provided me with information on encyclopaedia authority. Another part of the methodology was about conducting new empirical studies which explored the issue of encyclopaedia authority from three different perspectives. As a pragmatist, I believe that there are no wrong choices, as long as the methodology “works” and produces valid findings.

In this thesis, I conducted two literature reviews and three empirical studies. Not only did each of these studies generate enough valuable information regarding encyclopaedia to be considered as stand-alone pieces of research but –more importantly– each of them contributed something unique towards the understanding of encyclopaedia authority. It could be said that the pieces of glass I chose were different from one another:

- My first piece of glass was a recycled one which probably came from an old crystal ball because of its capacity to reveal the past. This is the literature review on encyclopaedia evolution.
- My second piece of glass –also recycled– probably came from a laboratory and was supposed to be a specimen of something new that a group of people were trying to create. This is the literature review on the previous research on *Wikipedia*.
- The other three pieces of glass that I used were all new and were specifically designed for my kaleidoscope. I wanted my first glass to be a powerful lens which could detect things at great distance (this was the study on encyclopaedia dissemination). I wanted the second glass to be able to record the presence and activity of people, something similar to those devices used to take fingerprints (this was the study on encyclopaedia development). Finally, I wanted a magnifying glass for quality control (this was the study of encyclopaedia quality assessment).

Each of these pieces appeared to work in a satisfactory manner. So all five of them were kept in the final device.

Response to the research question from the thesis chapters

One step before assembling the kaleidoscope consists of briefly testing each of the pieces of glass to be used. One wants to see in which way these pieces refract light and discover the kind of colour they bring to the kaleidoscope pattern. In this step, it helps if the pieces of glass are tested with the mirrors already chosen for the intended kaleidoscope. In fact, one does not need to wait until the kaleidoscope is fully assembled to start enjoying patterns appearing through the device. As long as the mirrors are already installed in the tube, a pattern should be visible even during the step when each piece of glass is tested. This pattern may only be monochrome; hence not as exciting as the intended final pattern, but it is already something to enjoy. To make the most of the experience, it is always recommended to have a predetermined strategy in mind (e.g. “I will first try to identify the dominant colour” or “I will first try to define the general shape”). Otherwise, one may get puzzled by the pattern on display.

Since the research findings are the equivalent of the kaleidoscope patterns, one can start by appreciating the different findings on encyclopaedia authority from each of the studies conducted during the thesis. At this stage, keeping the research question in mind when going through the findings in each chapter is important to remain focused on the thesis main findings –in other words, “How is encyclopaedia authority established?” Below is a summary of the response to the research question from the various studies conducted:

- In the literature review on encyclopaedia evolution, the weight of practice and tradition in establishing authority is underlined. Basically, a large part of encyclopaedia authority seems to be inherited, rather than actually earned. In the early days, this inheritance came from prestigious encyclopaedia authors and their encyclopaedias; whereas more recently, this inheritance comes more from well-known encyclopaedia publishing companies.
- By contrast, the review of previous research on *Wikipedia* reveals that, in the latest trends in online encyclopaedias, the authority of the publisher and the authority of the authors are of lesser importance in ensuring encyclopaedia authority compared to the quality of the content.

- The last study above clashes with the study of encyclopaedia dissemination since this latter indicates that, in contemporary printed encyclopaedias, the name of the publisher still plays an important role in ensuring encyclopaedia authority.
- In the study of encyclopaedia development, encyclopaedia authority is revealed from a different angle whereby it was the motivation and the effort of the encyclopaedia authors which was put forward. More specifically, these authors ensured that their encyclopaedias continue to fulfil the role of authoritative materials, thereby providing information, knowledge, and even of opinions, particularly in times of uncertainties and controversies. These authors also ensured that encyclopaedia content continues to appear scientific; hence authoritative.
- Finally, the study of encyclopaedia quality assessment is the one which challenges the most the authority of encyclopaedias. Indeed, not only does it unveil issues within contemporary encyclopaedias, but it also denounces a worrisome practice whereby encyclopaedias generally continue to be recommended despite the known issues.

Response to the research question from the thesis in general

Generally, the more diverse the kaleidoscope components, the more interesting the pattern obtained, and the more enjoyable the experience for the viewer. And even if one already knows how the mirrors and the pieces of glass work separately, one can never predict with certainty the pattern which appears once the kaleidoscope is fully assembled.

In this thesis, I considered two theories and conducted as many as five studies. I was guaranteed to witness spectacular shapes and colours. Ultimately, shapes and colours were indeed obtained, yet the display was not quite as clear as I was expecting. Indeed, to the main research question –“How is encyclopaedia authority established”– I could not come up with any straightforward or comprehensive answer. I felt like an overwhelmed child who could not find words to describe what is before her eyes.

My best attempt towards an answer to the research question is as follow. Surely, encyclopaedia authority is not as simple a phenomenon as the general public tend to assume. There seems to be no clear indication on the ultimate processes which actually determine encyclopaedia authority. For instance, processes whereby authority was established throughout the centuries are not necessarily of relevance anymore in recent times. Even in the 21st century, encyclopaedia authority is perceived differently by different entities, more specifically by the librarians purchasing encyclopaedias, by the book reviewers, and even by the encyclopaedia authors. Also, the general public's perception that encyclopaedias should be automatically considered authoritative was challenged in each of the studies conducted here.

Findings beyond the research question

There were additional points to make regarding the theory of cognitive authority. It was clear from this thesis that the existing theory of cognitive authority needs to be amended in order to give more importance to the quality of information transferred from the source of authority to the subject of authority. Also, the exact nature of the interaction between authority and quality is still open for future investigation. This thesis only gives a hint of the complexity of this interaction. For instance, it was mentioned several times that the general public often uses the terms authoritative and quality interchangeably. According to the frameworks used in quality assessment however, authority appears to be contained within quality. Indeed, a close analysis of the recommendations made by the library and information scientists on how to assess the quality of reference works reveals that as many as 10 (out of the 22 parameters defining the concept of quality) are considered to be associated with the concept of authority. When book reviewers are assessing the quality of encyclopaedias, even fewer parameters are still directly associated with authority. Until new results are brought forth, it appears to me that the emphasis is more on the quality of the published texts than on their authority. This may be explained by society's wariness of any form of authority in general.

Limits of the thesis and recommendations for future investigations

I believe my kaleidoscope is a little peculiar. When I tested the different pieces of glass on the device, I got recognisable patterns. But, when all the different components of the kaleidoscope are put together, the pattern on display becomes too complex or too abstract, to the extent that the images at the periphery of the field of vision are easier to grasp than those situated in the centre.

I was aware that each of the studies considered had its limits which are duly acknowledged and described in the Methodology Chapter. I tried to address or circumvent these issues whenever possible, but I did not always manage to solve all problems. It is possible that it is something in me, the researcher, which makes me see confusions where there are actually clear patterns emerging. After all, the capacity to appreciate the experience with a kaleidoscope depends on one's vision, perception of shape and colour as well as aesthetic preference. Other people may experience my kaleidoscope in totally different ways (i.e. they may find a clear answer to the research question on the basis of encyclopaedia authority).

In all cases, inconclusive findings are not necessarily an issue in the case of exploratory studies such as this one. Indeed, they clearly flag the fields for future investigation. For instance, an analysis of encyclopaedia authority from the perspective of the encyclopaedia reader could be of utmost importance, particularly considering the fact the recognition of a text as cognitive authority depends largely on the perception of the reader. Also, the exploration of encyclopaedia authority should not be limited to the theories of cognitive authority or quality. Some of these theories have been mentioned in previous research on *Wikipedia*. In fact, it is probably the research community which would benefit most from the current thesis. Indeed, on a theoretical level, suggestions for the revision of the theory are enunciated whereas, on a practical level, various fields of investigation are identified.

Concluding remarks

At the end of this thesis, when I try to spell out what was gained from my research on encyclopaedia authority, my thoughts immediately go to encyclopaedia developers and to encyclopaedia users.

- I believe encyclopaedia developers would benefit from the thesis once the thesis findings are converted into succinct guidelines. These guidelines could cover a variety of topics ranging from how to communicate science in general or scientific uncertainties and controversies in particular, to how to assess the quality of the writing, and what to avoid in encyclopaedia articles.
- For the general public, I believe that the most important priority would be to ensure that the misconception “encyclopaedias are the ultimate authority” is straightened. Encyclopaedias need to be approached with the same caution as any other type of publication using the same principles as those taught in information literacy.

When I go back to my home country, even if I do not bring in my suitcase a kaleidoscope which reveals the secrets of encyclopaedia authority, I know that I still have something to offer to the Malagasy –and other– encyclopaedia developers. That is enough of an encouragement to continue with research and to particularly explore other aspects of encyclopaedia authority.

APPENDICES

Appendix1. Materials emailed to encyclopaedia authors for the survey....	242
Appendix2. Examples of guidelines for encyclopaedias.....	244
Appendix3. Detailed comments made by book reviewers.....	249
Appendix4. List of book reviews considered for Chapter 9	290

Appendix1. Materials emailed to encyclopaedia authors for the survey



University of Glasgow | Faculty of Education

The University of Glasgow Charity number SC004401

Dear Madam, Dear Sir,

I am currently a PhD student from the University of Glasgow, UK. I am doing a research project entitled: **“Producing encyclopaedias for the 21st century: Covering scientific uncertainties and controversies in global warming and climate change”**.

I am writing to invite you to take part in this project which aims to investigate how authors from various online and printed encyclopaedias view their work, with a particular focus on their views on and experience with the coverage of scientific uncertainties and controversies. Participation in this project is totally voluntary. You may decline to participate, or withdraw from the study at any time without providing a reason.

As an author of encyclopaedia article(s) pertaining to global warming and climate change, you are invited to **share your experience by returning the questionnaire below by 15 June 2009**. When appropriate, a 30 minutes follow-up phone interview may also occur in a few months. You will be asked at the end of this email survey to specify whether you agree to participate in the follow-up phone interview or not. Participation in this project is totally voluntary. You may decline to participate, or withdraw from the project at any time without providing a reason.

All data collected will be kept confidential. The results will be reported in a manner which does not enable you to be identified in the thesis and research papers to be published from this study, thus ensuring your anonymity. But let me know at the end of the questionnaire if you want be acknowledged by name.

Thank you very much for your consideration.

Best,

Vanessa Rasoamampianina
Email: encyclopaedia@educ.gla.ac.uk

Other contact information:

Supervisors:	Prof. Alison Phipps	email: A.Phipps@educ.gla.ac.uk
	Dr. Rebecca Mancy	email: R.Mancy@educ.gla.ac.uk
Ethics Officer:	Dr. Georgina Wardle	email: G.Wardle@educ.gla.ac.uk

SURVEY QUESTIONNAIRE

We would like you to reflect on your past experience of writing encyclopaedia articles on global warming and climate change. Please provide as much detail as possible. Sections will expand as you type.

Your name: _____
Your institution: _____

For which encyclopaedia(s) have you written articles on global warming and climate change (*Tick as many as apply*)

- | | |
|--|---|
| <input type="checkbox"/> The Climate Change Collection from the Encyclopaedia of Earth | <input type="checkbox"/> Wikipedia |
| <input type="checkbox"/> The Encyclopaedia of Global Warming and Climate Change (SAGE Publications) | <input type="checkbox"/> Britannica Online |
| <input type="checkbox"/> The Oxford Companion to Global Change (Oxford University Press) | <input type="checkbox"/> MSN Encarta |
| <input type="checkbox"/> The International Encyclopaedia of Global Warming and Climate Change (Anmol Publishing) | <input type="checkbox"/> Other(s) (<i>Specify</i>): |

Please choose ONE of YOUR articles on global warming and climate change to reflect on (*Provide title and full reference*)

How would you describe yourself in relation to the topic of this article (*Tick as many as apply*)

- I am interested/passionate about this topic I have worked on this I am an expert on this

-----□-----□-----□-----□-----□-----□-----□-----□-----

ON WRITING THE ENCYCLOPAEDIA ARTICLE

1. How do you evaluate the nature of knowledge in the topic of the article mentioned above? (*Tick as many as apply*)

- | | |
|--|--|
| <input type="checkbox"/> It can be considered as simple and discrete facts | <input type="checkbox"/> It can be considered as complex and interrelated concepts |
| <input type="checkbox"/> It can be considered as stable knowledge | <input type="checkbox"/> It can be considered as evolving knowledge |
| <input type="checkbox"/> It can be considered as absolute knowledge | <input type="checkbox"/> It can be considered as tentative knowledge |
| <input type="checkbox"/> There is one version of knowledge | <input type="checkbox"/> There are various versions of knowledge |
| <input type="checkbox"/> Other(s) – <i>Specify</i> : | |

2. How do you think that knowledge needs to be presented in the encyclopaedia article? (*Tick as many as apply*)

- | | |
|--|--|
| <input type="checkbox"/> It needs to be presented as simple and discrete facts | <input type="checkbox"/> It needs to be presented as complex and interrelated concepts |
| <input type="checkbox"/> It needs to be presented as stable knowledge | <input type="checkbox"/> It needs to be presented as evolving knowledge |
| <input type="checkbox"/> It needs to be presented as absolute knowledge | <input type="checkbox"/> It needs to be presented as tentative knowledge |
| <input type="checkbox"/> Only one version of knowledge needs to be presented | <input type="checkbox"/> Various versions of knowledge need to be presented |
| <input type="checkbox"/> Other(s) – <i>Specify</i> : | |

3. Why do you think knowledge in encyclopaedia article should be presented in that way?

4. What were you trying to achieve through your article and what effect do you hope it will have on readers?

ON WRITING ABOUT SCIENTIFIC UNCERTAINTIES/CONTROVERSIES*

* *Note*: Scientific uncertainty refers to information where scientists have expressed uncertainty about a concept/ finding/event. Scientific controversy refers to information where various scientists have different understanding or interpretations of the same concept, finding, or event. Scientific controversy also refers to cases where scientists have reported different findings.

5. Please give examples of scientific uncertainties/controversies* pertaining to the topic of the article above and explain why these are scientific uncertainties/controversies*.

6. Which, if any, of these scientific uncertainties/controversies* did you cover in the article above, and why?

7. Which challenges did these scientific uncertainties/controversies* impose when you were writing the article?

8. Which strategies did you adopt to address these challenges?
For instance, how did you write about scientific uncertainties/controversies*?

9. Is the experience described above typical of how you usually approach scientific uncertainties/controversies*?

-----□-----□-----□-----□-----□-----□-----□-----□-----

Follow-up

Your contribution will be kept anonymous in the thesis and subsequent papers

Please specify here if you wish to be represented otherwise

Would you be willing to participate in future phone-interview if additional information is needed?

- No Yes - *Please provide details for further contact* Email: _____
Phone number or Skype ID: _____

Thank you very much for accepting to share your views and experience.

Please save the filled questionnaire and send it as an attachment to encyclopaedia@educ.gla.ac.uk by 15 June 2009.

Appendix2. Examples of guidelines for encyclopaedias

In the section below is a synopsis of the editing policy pertaining to the communication of scientific uncertainties and controversies (SU&C) in each of the five encyclopaedias considered in Chapter 8, except for *The Oxford Companion to Global Change*. Indeed, the Preface of the OUP encyclopaedia does not offer any specific indication regarding editing policy whereas the “Notes to Authors” provided on the OUP website⁷¹ only outlines formatting and editing guidelines and no recommendations regarding the communication of SU&C. It is, however, possible that the authors of this encyclopaedia were asked to follow additional editorial policies which could have been communicated directly by the commissioning editor but I did not have access to such document during the conduct of this study.

From the Encyclopaedia of Global Warming and Climate Change

The search for objectivity, particularly in areas of scientific controversies, is addressed in the “Style and Submission Guideline” (SAGE Reference n.d.) where it is requested that articles must be written in the most interdisciplinary way possible. Also, in addition to the provision of a balanced explanation of positions on controversial topics; advocacy or personal opinion must be avoided and very neutral tone must be used. Encyclopaedia authors are clearly told:

Do not use your article to... advance a debate, or argue a political point. Avoid rhetorical questions and never use the first person in your article (SAGE Reference n.d.).

The importance of the provision of comprehensive yet neutral views is also highlighted in the encyclopaedia Preface, as indicated below:

Scientific objectivities have been the watchwords for the editors of this encyclopaedia, yet different perspectives that various authors have on some of these issues are part of a conversation that [the readers] ignore at their own risk (Philander 2008, p.vii).

⁷¹ See http://fds.oup.com/www.oup.co.uk/pdf/bt/author_guidelines.pdf

Here, the readers are offered an assurance that all viewpoints are discussed objectively within the encyclopaedia. And, because the reader is invited to make up his or her own mind based on the information provided, it may be understood that the encyclopaedia does not overtly attempt to influence its readers.

Another editorial choice –which is not mentioned in the encyclopaedia Preface but emphasised in the “Style and submission guideline”– is the compliance to conservative viewpoints. For instance, there are recommendations given to the authors not to use articles to put forward “novel theories”. One may, however, wonder how far this compliance to conservative viewpoints may impinge with the search for neutrality and objectivity when, for instance, the authors who are commissioned to write articles on specific countries and US states are asked to

[cover] the status of climate change awareness in the country/state (for example, state-sponsored programs); possible contributions to human-induced climate change (for example, auto emissions); and possible impact of climate change on the country/state – from a conservative point of view (must) (SAGE Reference n.d.).

From The Encyclopaedia of Earth

The encyclopaedia is committed to objectivity through specific policies regarding neutralities and fairness. Not only the phraseology and the tone used should be neutral, but the content itself should be non-partisan, non-sectarian, without advocating particular positions regarding environmental issues. When touching upon issues of scientific controversies, the encyclopaedia policy specifies that:

the distinction between scientific and values controversy should be recognized, and every different view on a subject that attracts a significant portion of adherents shall be represented, with each such view and its arguments or evidence being expressed as fairly and sympathetically as possible.

In order to achieve fairness when dealing with controversial topics, it is further recommended that:

The *Encyclopedia of Earth* shall attempt, iteratively if necessary, to represent fairly and sympathetically the arguments of different disputants against each others' positions;

and that

space on areas of disagreement shall be apportioned roughly in proportion to their representation (1) among experts, when a dispute exists mainly among scholars; and (2) among the interested population, when a dispute exists mainly among the general population. When a dispute is equally a scholarly and a popular dispute, separate articles will be written to describe each dispute neutrally.

On the other hand, the encyclopaedia has an “inclusionist” policy in a way that scientific uncertainties are to be included rather than excluded and that various data, assumptions, interpretations and understandings are to be provided. However, contents which –according to the broad consensus within scientific community– do not provide discernible benefit to the advancement of knowledge and society or content are to be excluded from the encyclopaedia.

From Encyclopaedia Britannica

In the “Article Submission Guideline” posted on *Britannica’s* website,⁷² the emphasis is on “factual accuracy” and “steadfast objectivity” of the articles. Regarding the accuracy of the articles, *Britannica’s* policy seems to associate it closely with the concept of reliability. Encyclopaedia authors are, for instance, required to submit their article with “a list of authoritative sources consulted during the writing of the article” which the *Britannica* editors will use for fact-checking during the review process. Regarding the objectivity policy, there are not only specific recommendations on the treatment of scientific controversies but also on the tone and language to use. Below are relevant excerpts from the “Article Submission Guideline”:

The ideal of encyclopaedic objectivity means, at a minimum, that an article clearly and *fully explains each significant viewpoint* in neutral or non-prejudicial language and that it discusses related topics in ways that *do not unfairly favour one viewpoint over another*.

Encyclopaedic objectivity does not mean the complete absence or transcendence of perspective. Rather, it has to do with the way conflicting perspectives are treated: an article is objective to the extent that it recognizes, and treats with respect and fairness, *all significant conflicting viewpoints* on major topics of disagreement within, or appropriately related to, its subject matter. [Emphases added].

⁷² See <http://corporate.britannica.com/submission.html>

From Wikipedia

Editing guidelines for *Wikipedia* are interspersed in many places. In line with Wikimedia Foundation founding principles,⁷³ *Wikipedia* is grounded on its “Five pillars”.⁷⁴ But *Wikipedia* also has a *Manual of Style*⁷⁵, additional guidelines⁷⁶ and policies⁷⁷ as well as series of essays containing reflections on various aspects of *Wikipedia development*.⁷⁸

One of the Wikimedia Foundation founding principle and one of *Wikipedia*'s five pillars instate the use of “neutral point of view” as a key editing policy. Neutral point of view is explained as follow:

We strive for articles that document and explain the major points of view in a balanced impartial manner. We avoid advocacy and we characterize information and issues rather than debate them. In some areas there may be just one well-recognized point of view; in other areas we describe multiple points of view, presenting each accurately and in context, and not presenting any point of view as “the truth” or “the best view”. All articles must strive for verifiable accuracy: unreferenced material may be removed, so please provide references. Editors' personal experiences, interpretations, or opinions do not belong here. That means citing verifiable, authoritative sources, especially on controversial topics... (Excerpt from the “Five Pillars” page).

The concept of “neutral point of view” applies to all *Wikipedia* articles but even more so to those articles with scientific controversies. In fact, guidelines and instructions pertaining to scientific controversies abound in *Wikipedia*. Of high importance for the context of this thesis are the following pages:

- “Neutral point of view”:⁷⁹ This is the primary source of information on how to deal with scientific controversies. This page not only describes key concepts such as neutrality or due/undue weight, but it also informs about the appropriate tone and words to use. Moreover, the page highlights the challenges encountered by authors while trying to follow the *Wikipedia*

⁷³ See http://meta.wikimedia.org/wiki/Founding_principles

⁷⁴ See http://en.wikipedia.org/wiki/Wikipedia:Five_pillars

⁷⁵ See http://en.wikipedia.org/wiki/Wikipedia:Manual_of_Style

⁷⁶ See http://en.wikipedia.org/wiki/Wikipedia:List_of_guidelines

⁷⁷ See http://en.wikipedia.org/wiki/Wikipedia:List_of_policies

⁷⁸ See http://en.wikipedia.org/wiki/Category:Wikipedia_essays

⁷⁹ See http://en.wikipedia.org/wiki/Wikipedia:Neutral_point_of_view

guideline. For example, in the case of morally offensive views, one contributor questions: “Surely we are not to be neutral about *them*?”

- “Be neutral in form”:⁸⁰ One of the recommendations from this page is, for instance, “only write about controversies that had a lasting impact”. This page also has a note regarding the need to provide a historical and chronological overview in the case of articles on evolving concepts.
- “Fringe theories”:⁸¹ Here, authors are asked to ensure that such theories are represented in proportion to their prominence and not appear more notable than they are. The policy literally states that “An idea that is not broadly supported by scholarship in its field must not be given undue weight in an article about a mainstream idea, and reliable sources must be cited that affirm the relationship of the marginal idea to the mainstream idea in a serious and substantial manner”.

Because of the highly collaborative nature of the *Wikipedia* development, there are typically supporters for each side of a controversy –a situation which causes a lot of debates and “edit wars” within the *Wikipedia* community. Authors are, however, reminded that the goal is to represent the point of view of the main scholars and specialists who have produced reliable sources on the issue but not the point of view of all *Wikipedia* contributors.⁸² Additionally, *Wikipedia* has various ways to facilitate consensus-building between contributors: the editing procedure itself, the discussion within the community in the article talk pages, or the solicitation of outside opinion.⁸³

⁸⁰ See http://en.wikipedia.org/wiki/Wikipedia:Be_neutral_in_form

⁸¹ See http://en.wikipedia.org/wiki/Wikipedia:Fringe_theories

⁸² See http://en.wikipedia.org/wiki/Wikipedia:Describing_points_of_view

⁸³ See <http://en.wikipedia.org/wiki/Wikipedia:Consensus>

Appendix3. Detailed comments made by book reviewers

This section is closely linked to Chapter 9 regarding the quality of science and technology encyclopaedias. It provides a detailed account of:

- The reviewers' expectations on science and technology encyclopaedias;
- The reviewers' criticisms of science and technology encyclopaedias.

The same parameters and categories as listed in Chapter 2 and Chapter 9 are considered.

1. Reviewers' expectation on science and technology encyclopaedias

Category 1. Importance within the publishing industry

Purpose: Here, the reviewers mostly referred to the claims made in encyclopaedia prefaces regarding the reasons for the encyclopaedias to be developed. Most of the time, these prefaces insisted on the fact that the encyclopaedias were primarily designed to be a reference work (Haddad 2004, Das 2005), "a collection of articles that were solicited specifically to answer questions" (Loddenkemper and Zarowski 2010), or, as indicated by the following reviewer, to:

1. organize research knowledge ...;
 2. synthesize this knowledge into a form that is useful ...; and
 3. make this condensed knowledge accessible
- (Kennard et al. 2005).

In accordance with the recommendations given in Chapter 4, a couple of reviewers also checked whether the encyclopaedia authors achieved the goals they claimed they were aiming to (Buster 2001, Böhme 2004). Surprisingly, there were limited concerns for the general educational goal of the encyclopaedias, even though issues of *clarity* and *informativeness* were sometimes mentioned regarding specific articles or some of the illustrations, as further discussed in later paragraphs of this chapter. Among the rare exceptions, Laurent (2002)

discussed the usefulness of the *Wiley Encyclopedia of Molecular Medicine* as a “teaching aid”. Similarly, very few reviewers mentioned the take-home message of the encyclopaedias or the impact intended on the reader. Sometimes, the reviewers reproduced verbatim quotes from the preface as a way of highlighting the intention of the encyclopaedias authors, as seen in the review of the *Encyclopedia of Infectious Diseases*:

“The Encyclopaedia presents new multidisciplinary, holistic approaches that dramatically are changing our understanding of the pathogenesis of infectious research of infectious diseases and their treatments, as quoted from the cover of the book” (Skovgaard 2008).

Other times, the reviewer made speculations regarding the editors’ and authors’ motivations for compiling their encyclopaedias. For example, in the case of *The Whiplash Encyclopedia*, the reviewer indicated that the encyclopaedia author may be seen as condoning society’s compliance to the use of whiplash:

As soon as you open Ferrari’s book and read the dedication, you know that it is going to be very different: ‘Dedicated to all the workhorses, pack mules, sled dogs, slaves and mischievous children who suffered whip’s lash, with no chance to litigate.’ This immediately makes the reader wonder if the author has an axe to grind; a suspicion almost immediately confirmed by checking the table of contents - the first chapter is entitled ‘The Making of a Whiplash Culture’ - and reading the introduction to the second edition (page xxv) in which Ferrari states, in the first sentence, ‘Whiplash is an example of illness induced by society in general and by physicians in particular’... (Méal 2006).

Scope: All recommendations listed in Chapter 4 for this parameter were followed. Indeed, the reviewers typically provided a list or a summary of the subject covered within the encyclopaedia articles, sometimes even discussing the subjects covered chapter by chapter (e.g. Buster 2001, Wilkins 2004, Méal 2006). A few reviewers highlighted the emphasis made on specific content within the encyclopaedias (Clements 2002, Kennedy and Turan 2002). It was, however, much rarer for reviewers to mention any temporal or geographical boundaries in the subject coverage. In fact, such comments were only seen in the case of the *Encyclopaedia of Deer* which was reported to be focusing on species from North America only (Zachos 2008) and in the case of the *Concise Encyclopedia of Crop Improvement* which was reported to be covering a period from the beginning of the agriculture to into the era of modern technology (Modi 2008).

In addition to a general description of the texts, encyclopaedia reviewers also talked about the accompanying illustrations (e.g. Böhme 2004, Jones and Columb 2004) along with other components of the encyclopaedias such as the bibliography (e.g. Skovgaard 2001, Wilhelm 2004) or the glossary (e.g. Bandaipheth and Kennedy 2004, Modi 2008).

Audience: To assess whether the publishers' claims regarding the target audience for their encyclopaedias were appropriate, the reviewers usually compared these claims with their own estimations. For this, the reviewers typically indicated the type of users which would most benefit from the encyclopaedia. For instance, they wrote that the encyclopaedia under review was "suitable for undergraduates" (Enser 2006), "valuable resource for students and practitioners" (Butler 2004), or "invaluable tool for undergraduates and researchers" (Gibbons 2000). More commonly, the reviewers suggested the type of library which would mostly gain in purchasing the encyclopaedia (e.g. Chisti 2000, Edwards 2003, Haenlein 2004).

In a few cases, the reviewers went beyond providing simple estimations and tried to document the actual use of an earlier or a current version of the encyclopaedia under review. Some reviewers also reported about their observation of the encyclopaedia use by other people, for example:

The previous editions of the book, originally published in 1993, soon became an essential text for both trainees and senior anaesthetists alike and a useful reference text for ICU nursing staff and anaesthetic assistants (Jones and Columb 2004);

or

As for the audience mentioned in the preface; many of our anaesthetists, ODPs, theatre nurses and paramedics have gone out and bought the book after 'borrowing' my copy in the operating theatre. That fact speaks for itself! (Greenslade 2000).

A few reviewers even referred to their own use of the encyclopaedia (Tang 2000, Lawler 2002, Anonymous 2003a).

Worth: A lot of attention was given to justify why a specific encyclopaedia would be valuable to the target audience mentioned above. The reviewers did so in various ways. Some of reviewers indicated how the encyclopaedia could practically help people in their activities and professions (Böhme 2004). Other

reviewers pointed out the societal problems that the encyclopaedia was addressing (Kennedy and Jin 2005). Other reviewers highlighted the coverage of the recent scientific advances (Sparkman 2004). Even, the fact that the encyclopaedia covered topics which could be considered interesting and entertaining, bizarre and fascinating, or simply unexpected seemed to increase the worth of the work, for example:

Outbreaks of mass psychogenic illness have always held fascination for researchers and clinicians working in the psychosomatic field. These incidents often arise suddenly and are bizarre examples of how the mind, given the right circumstances, can quickly create symptoms and illnesses... There are many examples of the usual outbreaks at schools and factories but many other exotic ones involving slashers, phantoms, vampires, and various toxic substances... The book not only contains incidents of mass psychogenic illness but also episodes of panic, scares, fads, frenzies, and even riots. There are some interesting illnesses described such as Pokémon illness, riverter's ovaries, tollitis, and railway spine... Even Bin Laden makes a cameo appearance (Petrie 2010).

Aesthetic: As described in Chapter 4, this parameter refers to the appearance of the encyclopaedia in general. As expected, the reviews talked about “magnificent” and “beautiful” bindings (Chisti 2000, van Loon 2006, Windley 2006) and about the presentation and layout of the content (Sparkman 2004). The reviewers also talked about the writing style –which was praised when it made the article “entertaining as a novel” (Bell 2004, Skovgaard 2008), “an absorbing read” (Petrie 2010), “a personal text” (Zehntner 2004), or “particularly elegant review” (Murray-Wallace 2003) with “a real sense of enthusiasm that shines through” (Barrett and Henzi 2005). But the aspect which attracted most comments from the reviewers was pertaining to the aesthetic aspect of the illustrations. The reviewers noticeably valued coloured illustrations with crisp line drawings (Sapidis 2005, Windley 2006, Butler 2007).

Uniqueness: Here, the reviewers found various features which could distinguish the title under review from others encyclopaedias. The reviewers typically considered the encyclopaedia to be unique when it was the first –or at least the first since a long time– title to be dedicated to a particular subject. That was, for example, the case for *The Encyclopedia of Separation Science* reviewed by Haddad (2004) and the *Encyclopedia of Soils in the Environment* reviewed by Hartemink (2006). In fact, the choice of the subject itself might have set the

encyclopaedia apart, as seen in the *Encyclopedia of Bioterrorism Defense* which the reviewer (Bennett 2006a) considered as an “interesting, innovative, and frightening book”. Often, the reviewers also focused on the distinctiveness of the content, particularly the inclusion of topics which were not discussed in other encyclopaedias (Sapidis 2005) or topics which were treated in the greater depth (Das 2005, Windley 2006). But even the extraordinary volume of the content provided was considered noteworthy, as indicated in the following quote:

This encyclopaedia, in four volumes with 701 contributors and 2257 pages, with nearly 2000 entries, is going to have little competition for some time to come (Emery 2003).

Another distinguishing feature was pertaining to the way how some encyclopaedias were written from particular angles. For example, in the case of the *Encyclopedia of Global Environmental Change*, the reviewer (Murray-Wallace 2003) explained how the encyclopaedia was written with a mixture of traditional angles (e.g. multidisciplinary and historical perspectives, focus on modern changes of interest, comparison of modern instrumental records) and less traditional ones (e.g. ramification of environmental changes for humans). Or, in the case of the *Encyclopedia of Basic Epilepsy Research*, the reviewers (Loddenkemper and Zarowski 2010) highly valued the coverage of research topics which offered “a welcome counterpoint to other more clinically oriented epilepsy encyclopedias”.

An encyclopaedia was seen as unique from its look, particularly when it departed from the general expectations regarding encyclopaedias; for example when it had relatively fewer entries (Hartemink 2003) or when these entries were organised in a peculiar way (Skovgaard 2008). Additionally, the illustrations could also be distinctive, not only due to the type and amount of illustrations provided along the encyclopaedia articles but also due to the quality of the reproduction (Buster 2001, Böhme 2004). Finally, in the specific case of electronic and online encyclopaedias, the software and interface used to deliver the content could also be unique (Kratimenos 2001, Kennard *et al.* 2005).

Category 2. Encyclopaedia production

Production process: Some reviewers discussed the actual production and edition process as recommended for the quality assessment of traditional reference works. A handful of reviewers mentioned the number of years needed to complete the encyclopaedia (Emery 2003, Hartemink 2003, Desselberger 2009). Others praised the choice of encyclopaedia contributors (Griffin and Silliman 2009), as well as the particular effort made in providing contributors with detailed guidelines and instructions (Laurent 2002), in planning and homogenising the diversity of submissions (Sparkman 2004, Bennett 2006b) and in editing and proof-reading the final texts, particularly those coming from non-native English speakers (Bennett 2006b). Most of the time, the task of ensuring the quality of the encyclopaedia seemed left in the hands of the individual authors and editors, except when the reviewer singled out the careful intervention of editorial boards (Edwards 2003, Desselberger 2009) and editorial teams provided by the publishing house (Emery 2003). It was only in the case of the *Encyclopedia of Southern Appalachian Forest Ecosystems* that a “complete peer-review process similar to traditional scientific journals” was reported (Kennard et al. 2005).

Interestingly, the majority of the encyclopaedia reviewers considered in this study seemed to give a great importance to the number and diversity of people intervening in the encyclopaedia production process. Indeed, these aspects were mostly discussed by the information specialists who were conducting research on *Wikipedia* but not so much by those who were studying traditional encyclopaedias.

Many reviews also mentioned the number of contributors —a number which ranged between one contributor (as in the case of *the Whiplash Encyclopaedia*) to several hundreds (as in the case of the *Encyclopedia of Genetics* with over 700 authors). When the reviewers tried to assess whether the number of contributors was appropriate for the encyclopaedia under review, they did so by considering the size of the community of experts working in that particular area. For example, the reviewers checked that “the editors have been able to draw on the expertise of people who are closely associated with current thinking in each of

the areas covered” (Lawler 2002), that the “breadth of expertise ensure[d] authoritative entries on all aspects” (Griffin and Silliman 2009) and that no major names were omitted from the list of contributors (Hartemink 2003, Enser 2006), indicating thereby an unspoken preference for relatively large panel of contributors (e.g. Chisti 2000, Haddad 2004). At the same time, a relatively short list was not necessarily considered negative, as illustrated in the following example:

The authors were chosen well. Although in total, their names cover some 13 pages, it's not a big board of all the experts in every field, considering the great diversity of the subjects... just two or three out of the leading people were invited in each case to write the hundreds of chapters and subchapters (Zehntner 2004).

The diversity of the contributors was another aspect of the production process which many reviewers insisted upon. In a handful of cases, the reviewers (e.g. Clements 2002, Bennett 2006b, Enser 2006) expressed their satisfaction regarding the panel of contributors; particularly when this panel represented a variety of expertise, probably because a high diversity of expertise increases the chance for the encyclopaedia to be comprehensive with a greater variety of view points. More often, it was the country of origin of encyclopaedia contributors which was used as a proxy for diversity. Some reviewers actually made the effort of counting the number of countries involved in the encyclopaedia development (e.g. the anonymous reviewer of the *Smart Encyclopaedia* or Hartemink 2006). In general, the warmest praises were given to encyclopaedias with highly international panels (e.g. Batjes 2007, Loddenkemper and Zarowski 2010).

Whereas the information specialists mentioned in Chapter 4 only focused on the production of the text, the production of the illustrations also attracted the attention of encyclopaedia reviewers. The reviewers insisted on the importance of the illustrations which should have been specifically designed for the encyclopaedia, as clearly explained in the two quotes below:

Most of the line drawings seem to have been prepared specially for this encyclopedia, which nowhere gives the impression that some old stuff is being recycled; where ‘old’ figures are used, they have commonly been redrawn to make them consistent with the other line drawings (van Loon 2006);

The book is filled with high-quality illustrations that have clear legends... Many of these illustrations are original rather than

recycling material that has been seen many times before (Sparkman 2004)

Credentials of the contributors: Here, the reviewers mostly talked about the expertise and reputation of the authors and editors. Some reviewers clearly expressed their satisfaction regarding the choice of encyclopaedia contributors by using qualifiers such as “high-calibre contributors” (Clements 2002), “excellent authors” (Brookfield 2003), or “authors with wide range of experiences” (Das 2005). The reviewers also referred to the place hold by these contributors within the scientific community. Particularly appreciated were contributors who were “pioneers” (Sapidis 2005), “leaders in the field” (Kennedy and Turan 2002, Zehntner 2004, Skovgaard 2008), “well-established” (Hartemink 2006), “scientists of high reputation” (Böhme 2004), “world-renown” (Loddenkemper and Zarowski 2010), and “esteemed international authorities” (Kennedy and Mistry 2003).

Surprisingly, none of reviewers considered in this study mentioned the reputation of the encyclopaedia publishers. Although the name of the publishing company was typically mentioned in the title of the book review, along with the full reference of the encyclopaedia, the publishers’ name was hardly ever mentioned anywhere else within the review. May be the reviewers did not think it was necessary to attest the reputation of the publishers because the one involved in the publication of the encyclopaedias covered in these book reviews were already considered well-known (e.g. Elsevier/Academic Press, Wiley, Oxford University Press, etc.) But it was also possible that the reviewers assumed that the publishers’ reputation was not relevant to the quality of encyclopaedias. After all, even the intervention of the editorial team in the production process was discussed by only a couple of reviewers (see earlier discussion).

Category 3. Encyclopaedia content

Completeness of the content: The breadth of coverage and the depth of treatment were typically addressed simultaneously in encyclopaedia reviews. In general, there was slightly more emphasis on the former than on the latter. To indicate their satisfaction with the breadth and depth of the encyclopaedia

coverage, the reviewers often used adjectives such as “broad” (Sparkman 2001), “comprehensive” (Jones and Columb 2004), “extensive” (Windley 2006), “all-encompassing” (Haddad 2004), “wide ranging” (Butler 2004), or even “encyclopedic” (Griffin and Silliman 2009).

The breadth of subject coverage within the text was typically analysed at the level of the entire encyclopaedia and was defined in various ways. Some reviewers insisted that all topics (e.g. Rugg 2003, Kennedy and Jin 2005) –or at least the major ones (e.g. Jones and Columb 2004, Butler 2007)– should be covered. Other reviewers seemed satisfied as long as a diversity of topics was provided (e.g. Greenslade 2000). A few reviewers found it particularly important that the breadth of coverage should be wide enough to satisfy the targeted readership (Kratimenos 2001, Emery 2003), including an international audience (Lord 2006). It was also seen as a good thing that encyclopaedias did not shy away from topics which were not well-studied (Anonymous 2002) or which were unusual and exotic (Petrie 2010). Additionally, discussions on how far back in time the coverage should go were also mentioned by some reviewers, although no standard could be applied to all as things depends on the scope of the encyclopaedia. For example, the reviewer of the *Encyclopedia of Nuclear Magnetic Resonance* was satisfied with information covering the last five years before the encyclopaedia publication date (Anonymous 2003c) whereas the reviewer of the *Encyclopedia of Atmospheric Sciences* talked about information covering the previous two decades (Karipot *et al.* 2005).

When it came to assessing the depth of the treatment of these various topics, the reviewers did not limit their comments to a general assessment at the level of the encyclopaedia but often analysed specific articles. To present a summary of the basic information on the field was rarely seen as enough for an encyclopaedia (Lawler 2002, Griffin and Silliman 2009). Instead, the majority of the reviewers indicated that encyclopaedias should include as much detailed and factual information as possible (e.g. Böhme 2004, Parveen and Kennedy 2007). Many reviewers also insisted that the treatments of the topics should be in-depth and should include a variety of aspects (e.g. Clements 2002, Parveen and Kennedy 2007, Griffin and Silliman 2009). In particular, a couple of reviewers highlighted the importance of looking at both the theoretical and the practical aspects (e.g. Bennett 2006c, Kemerait 2006).

Finally, regarding the completeness of other encyclopaedia components (e.g. the glossary and the bibliography), it should be noted that the reviewers mostly commented on the amount of space allocated to them (e.g. Williams 2001). Regarding encyclopaedia illustrations in particular, the questions that the reviewers tried to answer were: Were there enough illustrations (Kettle 2001)? And did the illustrations provide detailed information (Sparkman 2001, Jones and Columb 2004)?

Clarity of the content: As expected from Chapter 4, the majority of the reviewers looked at the degree of concision of the information provided (e.g. Haenlein 2004, Sapidis 2005, Zachos 2008) as well as at the readability of the text within the encyclopaedia articles (e.g. Kettle 2001, Haddad 2004). For example, the reviewers talked about articles in “a concentrate but clear form” (Haenlein 2004) or about a book which was “easily accessible” (Bandaiphet and Kennedy 2004), “easy to follow” (Brookfield 2003) or “easy to read” (Modi 2008). Interestingly, no reviewer referred to any of the standard readability indexes. That did not prevent them from providing a general assessment of the readability - checking in the same occasion the appropriateness for the target audience, as in the following example:

the writing falls near that of an advanced undergraduate text to a professional review (Anonymous 2003a).

The reviewers seemed to particularly value what Sparkman (2001) labelled “the keep-it-simple principle” whereby the encyclopaedia authors were expected to provide well-written and direct texts with concise and precise definitions as well as with clear explanations (e.g. Wilhelm 2004, Karipot *et al.* 2005). Additionally, the reviewers expected the encyclopaedia authors to use a clear language without unnecessary jargons (Jones and Columb 2004). On the other hand, one reviewer indicated that a clear structure of the argumentation and a logical order in the presentation of the ideas could improve the readability of the text, particularly when these were done following existing standards in the field:

This book follows the convention that parasites and pathogens can be transmitted by vectors, and that infections also can be transmitted in that way, but that diseases, even infectious diseases, are not ‘transmitted’. This convention may appear pedantic, but it imposes a clarity of thought that is helpful (Clements 2002).

In almost direct opposition to that last claim, another reviewer wrote:

The authors seem to have been given the freedom of how to subdivide their texts and this benefits the readability as well (Zehntner 2004).

I believe that these two last approaches to encyclopaedia clarity are not necessarily contradictory. They can both be valid, for example, when the various authors are simply using different but well established standards within their respective fields.

Another apparent contradiction between reviewers' views on encyclopaedia clarity can be seen in the example below, when some reviewers claimed that:

One of the most important authoring rules was that each page be independently understandable and self-contained (Kennard et al. 2005);

whereas other reviewers refuted that rule by claiming that the overlap between contributions was not always detrimental as long as there was no contradiction in the content (Brookfield 2003, Zehntner 2004). In general, however, the reviewers did not seem to check the “intrinsic naturalness”, “intrinsic cohesiveness”, “intrinsic semantic consistency” and “intrinsic structural consistency” of encyclopaedia content, as recommended in Chapter 4.

Another aspect of content clarity which was considered by encyclopaedia reviewers but which was not described in Chapter 4 was the clarity of the illustrations, particularly the pictures and lines drawings. This was an aspect of quality discussed by several reviewers. In many cases, the clarity of the illustrations such as the clarity of line drawings or the quality of a picture were highly related to the quality of production (Butler 2007).

Despite the fact that the encyclopaedia illustrations were expected to provide detailed information before they could be considered complete, they still needed to remain relatively simple (Jones and Columb 2004), particularly the line drawings. The reviewers also reported that the clarity of the titles and legends could also enhance the general clarity of the illustrations (Sparkman 2004), and so did the judicious use of colour, as in the case of the illustrations of human embryos and foetus in the *Encyclopedia of Visual Medicine*:

Many of these images are translucent and colored in such a way as to depict most strikingly the manner in which internal structures

support and determine the shape of external features (Buster 2001).

Accuracy of the content: From the recommendations discussed in Chapter 4, comments on the interpretation or representation of the subjects covered within the encyclopaedias were the only ones not found in the reviews analysed in the current chapter. The reviewers who commented on the accuracy of the content usually just wrote that the encyclopaedia was “accurate” (e.g. Bandaiphet and Kennedy 2004, Modi 2008). Some reviewers made comments regarding the accuracy of the information provided within the encyclopaedia text (Greenslade 2000, Lord 2006) whereas a few others looked at the spelling and grammar (e.g. Wilkins 2004, Enser 2006).

Beyond the accuracy of the encyclopaedia text, there were also the comments made on the accuracy of the bibliographic list within encyclopaedia (Chisti 2000, Hartemink 2006) as well as the comments on the accuracy of the illustrations (van der Meijden 2001, Anonymous 2003a, Enser 2006).

Reliability of the content: Here, the reviewers often claimed that the encyclopaedia content was sound and widely used the adjective “authoritative” (Griffin and Silliman 2009), as in “authoritative source of information” (Bandaiphet and Kennedy 2004), “authoritative overviews” (Haddad 2004), “authoritative read” (Petrie 2010), “authoritative reference” (Kennedy and Jin 2005). Several times, such claims were made in combination with a general satisfaction regarding other parameters such as the completeness, clarity and accuracy of the encyclopaedias as discussed earlier. Additionally, one reviewer (Kemerait 2006) indicated that the author of the encyclopaedia “speaks with authority” and was referring perhaps with the writing style, whereas other reviewers (Kennedy and Jin 2005) were referring more to the trustworthiness of the information provided within the encyclopaedia.

The authority, trustworthiness or veracity of the encyclopaedia content was more often asserted by the links made to the scientific literature. Indeed, the reviewers often checked the thoroughness of the use of references (Gibbons 2000, Rugg 2003, Böhme 2004, Bennett 2006c), as well as the type of literature used as sources of information such as the use of “original papers” (Böhme

2004), “classic reviews” (Castracane 2003), “primary source” (Petrie 2010), and “primary literature” (Wilkins 2004), or the length of the reference list (Berg 2003). In one case, the reviewers (Karipot et al. 2005) looked beyond the reliability of the information within the text by checking the source of the illustrations used and seemed pleased that high quality illustrations, maps and photographs were taken from scientific literature.

Objectivity of the content: In Chapter 4, it is recommended that the reviewers should check both the balance in the choice of subjects and the objectivity of the subject treatment. These recommendations were, on the whole, followed by the encyclopaedia reviewers.

In general, the fact that all subjects were covered equally within a given encyclopaedia or that all aspects of an argument were presented on a given topic were considered very positively (e.g. Anonymous 2003a, Sapidis 2005). Moreover, some reviewers expected encyclopaedia authors to also pay consideration for the relative importance of each subject (e.g. Chisti 2000, Emery 2003). The reviewer quoted below even estimated the space allocated to the various subjects within *The Encyclopedia of Arthropod-Transmitted Infections of Man and Domesticated Animals* and wanted it to reflect the relative importance of the various subjects:

We are told in the Preface that ‘the aim has been to present up-to-date information on the transmission of a broad range of infections’... But where the topic is ‘Malaria, human’, the description of transmission occupies less than 10% of the article, while the description of anti-malarial drugs occupies almost 25%. Possibly this balance reflects the relative interest that is shown currently in these 2 aspects of malaria and the information that readers are likely to seek (Clements 2002).

Although not specifically mentioned in the recommendations in Chapter 4, the reviewers were expecting the encyclopaedias and the encyclopaedia articles to be multidisciplinary. Regardless of the extent to which the coverage was narrow, the treatment of the topic was still expected to come from a variety of scientific perspectives (Chisti 2000, Edwards 2003).

The task of checking the objectivity of the content also included making sure that there was no country-specific bias and that the content of the encyclopaedia reflected the reality from all over the world (e.g. Jones and

Columb 2004, Hartemink 2006, van Loon 2006). There were, however, cases where it was considered acceptable –almost unavoidable– that the content of an encyclopaedia focuses on one or a limited number of countries. That was the case when the topic of the encyclopaedia was not of high relevance for the rest of the world. For example, the reviewer below wrote about *The Encyclopedia of Deer*:

Rue focuses on North American species, in particular white-tailed deer and wapiti which are described in more detail than the other species, but this does by no means devalue the book (Zachos 2008).

Regarding the treatment of the subject coverage, the reviewers used various ways to check that it was done in an objective fashion. For example, the reviewers ensured that a diversity of viewpoints was presented (Sapidis 2005, Kemerait 2006). Also, they recognised the potential risk of authors to deliberately bias the content of their encyclopaedias and to indulge in self-promotion. One of the reviewers (Sapidis 2005) expressed his satisfaction when he saw that the articles he reviewed were “fully exploring a specific subject with emphasis on fundamental concepts and tools, instead of reiterating recent research of its author(s)”. Similarly, the reviewer below wrote:

the authors managed to avoid turning their sections into detailed reviews of their own research and provided the balanced literature coverage one would expect in an encyclopedia (Wilkins 2004).

In one case (the review of the *Encyclopaedia of Atmospheric Science*), the reviewer (Karipot *et al.* 2005) also looked at the way how scientific uncertainties and controversies were treated and he indicated a preference for encyclopaedias to keep the debate open when there is no consensus yet within the scientific community (The treatment of scientific uncertainties and controversies is discussed further in Chapter 10 of this thesis).

Finally, the tone and language (Hartemink 2006) as well as the type of evidences used to back up claims (Barrett and Henzi 2005) and the choice of reference (Carvel 2001) also allowed encyclopaedia reviewers to check about the objectivity of content. Interestingly, encyclopaedia reviewers did not mention anything about stereotypes as recommended in Chapter 4 –maybe because stereotypes were less common in the field of science and technology.

Currency of the content: Here, the reviewers mostly focused on how up-to-date the information provided were at the time of publication of the encyclopaedias. The reviewers started by checking the currency of the scientific ideas and concepts. For example, Sapidis (2005) verified whether the encyclopaedia was “a comprehensive collection of knowledge that has been collected to date” whereas Murray-Wallace (2003) investigated whether the encyclopaedia offered a “representative overview of the state of knowledge on a particular subject for its era”. The reviewers also ensured that the encyclopaedia addressed contemporary problems and concerns (Skovgaard 2001, Murray-Wallace 2003) and covered the current scientific views and consensus (Butler 2004) as well as the most recent scientific and technological advances (Berg 2003, Desselberger 2009). Even the currency of the bibliographical references used to support the claims made within the articles were deemed important by many reviewers (e.g. van der Meijden 2001, Wilkins 2004, Fisher 2009).

An alternative way to assess the currency of an encyclopaedia –point not discussed in Chapter 4– was to look at the list of contributors. For example, Lawler (2002) check whether the most active scientists in the field in recent years were involved.

On the other hand, the reviewers also looked at the frequency of update. For printed encyclopaedias, they checked whether the new edition contained the latest scientific development which occurred since the last time the encyclopaedia was published (Anonymous 2003c, Desselberger 2009). Some reviewers verified that all entries, not just some of them, had been updated (Chisti 2000, Brookfield 2003). No reviewer, however, commented on whether the delay between the subsequent printed editions was too short or, on the contrary, too long. Instead, the reviewers sometimes suggested that publishers should publish existing encyclopaedias into online format which would then make the continuous update of the content possible (Tang 2000, Desselberger 2009).

For the encyclopaedias already available online, there seemed to be a widespread assumption that they would be updated (Anonymous 2002, Loddenkemper and Zarowski 2010) although the reviewers did not seem to really check whether that was actually the case. In fact, within the reviews considered

in this study, continuous update seemed to have only been really practised in *Catalysis from A to Z: A Concise Encyclopedia* (Anonymous 2003b). When continuous update of online materials was not possible, it appeared that even a quarterly update was considered satisfactory as seen in the review written by Edwards (2003) on the *Encyclopedia of Soil Science*.

In all cases, the reviewers had to accept that there was generally a lag before an information finally appeared inside encyclopaedias (Lawler 2002, Lord 2006). So, the pending question for all was how recent was recent enough. The answer to this question varied from one review to the next. Depending on the topic and on the circumstances of the publication, the age of the information may or may not be outdated. For example, information which was two years old at the time of publication was considered acceptable in the following case:

This encyclopedia appeared at PittCon 2000 (...) It appears that most of the articles were written in 1998. This would be consistent with the fact that Allan Maccoll, who authored the Mass Spectrometry Historical Overview article entitled “Mass Spectrometry, Historical Perspective” died on February 16, 1999. However, the material and subjects covered are far from dated when considered as a perspective of the topics (Sparkman 2001).

On the other hand, it was indicated that information could be considered updated if applied in developing countries but could be outdated and inappropriate elsewhere. For example, the reviewer below wrote about the article on evidential sampling in case of rapes from the *Encyclopedia of Forensic and Legal Medicine*:

While the examination is covered in great detail there are some things which concern me. The writer still mentions Glaister's Rods and only dismisses them on the grounds of the difficulty in sterilising them. These rods have now been largely superseded by Foley catheters. There is no mention of the use of colposcopy. He advocates a blood sample for DNA and still mentions saliva to determine secretor status (...) The writer does not mention the use of a speculum for the high vaginal swabs, only the endocervical swab. I realise that the writer of the article is based in Malaysia but for an encyclopaedia which is in the English language and is going to be read world-wide I think the information should have been more internationally comprehensive and up-to-date (Lord 2006).

Interestingly, one reviewer (van Loon 2006) indicated that, it was not always necessary to provide all the latest information within an encyclopaedia particularly when the information was highly volatile. Instead, to ensure a

stability of the encyclopaedia content, the focus could be on the “eternal topics” as explained below:

An encyclopedia was originally meant to provide a complete overview of the knowledge then available. This is, obviously, no longer possible, not even in one discipline such as the earth sciences. Not only has the total of our knowledge expanded so much that covering this knowledge would require an encyclopedia that could well fill several libraries, but also are technologies changing rapidly. I think that it was a wise decision of the editors not to pay much attention to the newest technologies and apparatuses in geophysics and geochemistry: such information would have become outdated soon. The more ‘eternal’ topics should, however, be present... On the other hand, the physical restrictions with respect to the size of the encyclopedia on one hand, and the overwhelming number of topics in both fundamental and applied earth sciences must have forced the editors, advisors and contributors to make choices (van Loon 2006).

Finally, regarding the currency of the encyclopaedia bibliography, some reviewers wanted the difference between the year of publication of the encyclopaedia and the year of publication of the most recent references to be at most one year (Berg 2003). Other reviewers were satisfied for this difference to be two years (Lawler 2002, Desselberger 2009), three years (Loddenkemper and Zarowski 2010) or even many more years, as seen in the excerpt below was about the *Encyclopaedia of Dairy Science* which was published in 2003:

You will not find the most recent references. The time lag to the proposed readings is sometimes considerable, but you can't say it is outdated. Examples: The “Bifidobacterium” chapter refers to papers from 1991 to 1998, “Prebiotics” 1983-1999, “Lactobacillus” 1986-1999. There is an information gap of about 4 years from the publishing day and this gap will grow inevitably as the Encyclopedia will get older (Zehntner 2004).

Stability of the content: Within the sample of reviews considered for this study, no reviewer seemed to have encountered issue with volatile information. Consequently, the reviewers mostly discussed the durability of the encyclopaedia. They checked the “long-term value” of the information provided (Castracane 2003) and the “timelessness” of the articles (Sparkman 2004). In fact, several reviewers literally used the term “for many years to come” (Emery 2003, Sparkman 2004, Hartemink 2006) while talking about the durability of the encyclopaedia.

Informativeness of the content: Many reviewers looked at the informativeness of illustrations (e.g. Böhme 2004, Parveen and Kennedy 2007). However, none of them looked at the links provided in electronic and online encyclopaedias. Beyond the recommendations from Chapter 4, encyclopaedia reviewers also looked at the informativeness of the actual text within the various articles, as well as the usefulness of the bibliography and the value of the Glossary.

There were various things that reviewers checked to make sure that the text within the encyclopaedia articles communicated the information needed. Some reviewers verified that the amount of details provided was appropriate (Bell 2004) and that the information deemed as key or essential were covered (Edwards 2003, Fisher 2009) along with some useful explanations (Buster 2001, Sparkman 2004). The fact that encyclopaedia authors provided some background information and put the subjects into their respective disciplinary and social context was also highly valued (Murray-Wallace 2003, Petrie 2010). Additionally, some reviewers insisted on the need to provide an overview or introductory section before in-depth discussion of the main topic of the article (Sparkman 2004, Karipot *et al.* 2005).

Regarding the reference and bibliographical notes accompanying the encyclopaedia text, the reviewers generally insisted that they should be well chosen to allow the reader to get more in-depth understanding of the topic covered (Kennedy and Bandaipheth 2003, Das 2005). By contrast, the List of Suggested Reading was more seen as a source of information for follow-up of what had been discussed in the encyclopaedia articles (Kemerait 2006) and one reviewer (Zehntner 2004) thought the reading should not overwhelm the reader.

Finally, regarding the informativeness of the glossary, the focus was mostly on the need to not only define the various abbreviations used within the encyclopaedia (Desselberger 2009) but also to explain the technical terms (Skovgaard 2001, Modi 2008, Griffin and Silliman 2009).

Representativeness of the content: Here, a few reviewers assessed whether the encyclopaedia content fulfilled the general expectations regarding encyclopaedias; for example, the tone used (Hartemink 2006) or the writing style (Sparkman 2004), the length of the article (Hartemink 2003), or the

presentation of the references (Bell 2004). More reviewers checked whether the encyclopaedia content reflected existing conventions within the subject field. For this, some reviewers checked whether the topics covered within the encyclopaedia were the one mostly discussed within the field (Wilkins 2004, Barrett and Henzi 2005) and whether the discussion included the most common points of view. To illustrate this latter point, Watkinson (2003), for example, indicated that an ecological perspective was expected for the *Encyclopedia of Global Environmental Change*. Other reviewers looked at the use of agreed terminology and nomenclatures; for example the use of the word “transmission” within *The Encyclopedia of Arthropod-Transmitted Infections of Man and Domesticated Animals* (Clements 2002), or the use of the latest time scales and stratigraphic charts in the *Encyclopedia of Geology* (van Loon 2006).

Category 4. Information retrieval

Arrangement of the encyclopaedia content: As recommended in Chapter 4, many of the reviewers mentioned the system used to organise the articles within the encyclopaedia under review, either it was alphabetic (e.g. Greenslade 2000, Emery 2003), thematic (Haddad 2004, Sparkman 2004, Das 2005) or a combination of the two systems (Edwards 2003, Enser 2006). Although several reviewers found the alphabetical arrangement to be satisfactory (Tang 2000, Wilde 2002, Emery 2003), there were also reviewers who seemed to prefer a thematic arrangement (Karipot *et al.* 2005) or the combination of the two systems. The reviewer below explained:

The alphabetical format breaks down traditional barriers between subjects, such that ‘Rogue Waves’ is directly before ‘Rotifers’ and ‘Management and Regulation’ is next to ‘Mantis shrimps’. The unsuspecting reader may soon find themselves sidetracked (Griffin and Silliman 2009 on *The Encyclopedia of Tidepools and Rocky Shores*).

The reviewers also indicated where the various encyclopaedia components were situated; for example, in the case of the *Encyclopedia of Gastroenterology*, the reviewer wrote:

Article titles begin with the keyword or phrase indicating the topic, followed by any generic term. Articles are arranged in a standard format starting from title, glossary, defining statement, body of the article, cross-references and further reading (Bianchi Porro 2006);

or, in the case of the *Encyclopedia of Soils in the Environment*:

Most entries have a similar lay-out: introduction, main sections with some tables, graphs, and diagrams; sometimes a summary and list of technical nomenclature at the end, followed by further reading containing 5-20 references (Hartemink 2006).

Some reviewers only mentioned the place of the references and the list of suggested reading which could be immediately at the end of each article (Bandaiphet and Kennedy 2004, Butler 2007), at the end of the volume (Kemerait 2006) or “at the end of each alphabetical section” (Petrie 2010). Other reviewers talked about the organisation of the article headings and subheadings (Carvel 2001, Clements 2002, Bennett 2006a), the sequence of various types of information within the encyclopaedia articles (Parveen and Kennedy 2007). Even the place of bullet lists and other illustrations such as tables, graphs, pictures were sometimes mentioned (Kennard *et al.* 2005). Additionally, the reviewers indicated the use of special formatting and notations within the encyclopaedia whenever appropriate. See the three examples below:

Each article has a two-line marking block below its title. The top line identifies the subject area, and the line just below indicates the category (Sparkman 2001);

The start of each letter section is clearly marked with a large boxed letter, and the subject of every entry is in bold type (Rugg 2003);

When an entry is mentioned within the text of another entry, it is marked with an asterisk (Bell 2004).

Concerning online encyclopaedias, the only comments found within my sample of reviews indicated that the arrangement of the content may be more complex than in the printed form. That was seen in the case of the *Encyclopedia of Southern Appalachian Forest Ecosystems* where the reviewer explained:

Content within each of these major sections is organized in a hierarchical structure, where each page has one parent page and one or more child pages below it. This tree-like structure is represented as a linked collapsible menu in the left frame (Kennard *et al.* 2005).

Search device available: Here, the reviewers looked at the type of items listed in the encyclopaedia table of content, for example the list of articles or the list of themes, tables and figures (Sparkman 2001, Kennard *et al.* 2005, Batjes 2007). The presence of indexes and cross-referencing were also often mentioned, although only a few reviewers took the time to provide more

description. More specifically, the encyclopaedia index could list subjects (Kettle 2001) and authors (Kennedy and Bandaipheth 2003), as well as Latin names of species (Bandaipheth and Kennedy 2004), molecular formula (Kennedy and Turan 2002). Regarding the cross-references, the reviewer of the *Encyclopedia of Marine Mammals* wrote:

It has three different types of cross-reference, including marginal headings within the A-Z article sequences, capitalization of words within the text that are covered in detail in other sections and a list of related topics at the end of each section (Lawler 2002);

whereas the reviewer of the *Encyclopedia of Common Natural Ingredients* used in Food, Drugs and Cosmetics indicated that:

Each entry is presented in alphabetical order according to its common name (which is cross-referenced to its scientific name in the index) (Bandaipheth and Kennedy 2004).

In the case of electronic and online encyclopaedias, the reviewers also made comments on the search engines (Gibbons 2000, Haddad 2004, Kennard *et al.* 2005) and hyperlinks (Carvel 2001, Vercelli 2007, Loddenkemper and Zarowski 2010).

It was not rare that the reviewers commented on the effectiveness of the various search devices. There were many comments on the comprehensiveness of the table of content, indexes, and cross-references (Haenlein 2004, Batjes 2007). There were also comments indicating whether the search devices actually allow the readers to find the information needed (Parveen and Kennedy 2007, Loddenkemper and Zarowski 2010). The following quote provides an illustration on this last point:

What impresses me most about this book is that it manages to cross-reference so effectively between sections. .. This can be really effective where one article gives a broad overview of an issue, but then links to others that expand on particular aspects. For example, with my own background in aerial surveys of dugongs, I turned to the “surveys” section. At first I thought it too broad and lacking in depth, but then found that if I followed the directions to articles on Abundance Estimation, Distribution, etc., I quickly had quite a complete picture. (Lawler 2002 on the *Encyclopedia of Marine Mammals*)

Additionally, some reviewers assessed how easy (Rugg 2003, Kennedy and Jin 2005, Hartemink 2006) –and how fast (Gibbons 2000)– it was to locate specific information using these search devices.

Category 5. Encyclopaedia delivery

Format of publication: Here, the reviewers mostly indicated whether the encyclopaedia was delivered as printed volumes, but also as CD-ROMs (Gibbons 2000, Vercelli 2007), and/or as online materials (Edwards 2003, Hartemink 2006). When commenting about the appropriateness of printed encyclopaedias in particular, a few reviewers talked about the size of printed volume, for example:

Unlike the classical, bookcase-filling encyclopedias such as *Encyclopedia Britannica* or *World Book* however, the *Encyclopedia of Tidepools and Rocky Shores* thankfully comes in a single, though extremely hefty, volume (Griffin and Silliman 2009).

Finally, regarding the sturdiness of the delivery format, one reviewer mentioned the encyclopaedia binding which was deemed appropriate “for the heaving handling by numerous students and researchers” (Sparkman 2004) whereas another reviewer commented on “totally crash proof” CD-ROMs (Kratimenos 2001).

User-friendliness of the encyclopaedia: For printed encyclopaedias, a couple of reviewers mentioned the two-column layout of the text (Jones and Columb 2004, Sparkman 2004) but no reviewer commented on the size of the characters or the density of the text. On the other hand, the presence of help sections (Kratimenos 2001) and user-manuals (e.g. Bell 2004, Haddad 2004) were mentioned in several instances. Additionally, the use of feedback forms was mentioned in the case of the *Encyclopedia of Southern Appalachian Forest Ecosystems* (Kennard *et al.* 2005).

Regarding additional features which allowed non-printed encyclopaedia to become more user-friendly, the following comments were made: the ease of installation and use of CD-ROMs (Vercelli 2007), the possibility to print sections of the text as needed (Kratimenos 2001), the possibility to download full articles as full text HTML and PDF files (Windley 2006), or the email the article function as well as “the display showing text plus thumbnail figures to initially determine whether I was interested in the particular article” (Haddad 2004).

Cost: Typically, the price of the encyclopaedia was provided at the very beginning (along with the title of the review) or at the end of review. In some cases the reviewers indicated whether the encyclopaedia was affordable (Rugg 2003, Butler 2004), or reasonable considering the encyclopaedia size, quality and potential use. For example, reviewers wrote:

I am often very critical of the price of books today; however, at an average price of \$4.95 per article, *The Encyclopedia of Mass Spectrometry...* is an excellent value (Sparkman 2004);

or

At a whopping £105.99 it might first appear quite expensive. However, with 736 pages of material that explores the facts and myths about whiplash, it represents good value for all of us involved in the treatment of such patients (Méal 2006).

2. Reviewers' criticisms of science and technology encyclopaedias

This Appendix is closely linked to Chapter 10. It provides a detailed overview of the mixed and negative comments made by book regarding

- Category 1. Importance within the publishing industry;
- Category 2. Encyclopaedia production;
- Category 3. Encyclopaedia content;
- Category 4. Information retrieval; and
- Category 5. Encyclopaedia delivery.

As an attempt to challenge the public preconceived idea that encyclopaedias are the ultimate reference works or the unquestionable sources of truth, this section highlights the shortcomings found in science and quality encyclopaedias. Combined with the findings from Chapter 9, this section helps develop an understanding of which of the encyclopaedia shortcomings could be acceptable (and do not jeopardize the reviewers' final verdict) and which one could be unpardonable.

Category 1. Importance within the publishing industry

Within this category, negative and mixed comments were only found in the following three parameters for quality assessment: *audience* of the encyclopaedia, *worth* and *aesthetic value* of the encyclopaedia.

Audience: There were cases where the editors' target audience and the reviewers' assessment of the appropriate audience did not perfectly match. When there was a disagreement, the editors had claimed that the encyclopaedia was pitched to a general or low-level readership whereas the reviewers had judged the encyclopaedia content to be too complex for such an audience (Brookfield 2003, Haddad 2004, Barrett and Henzi 2005). For example:

The *Encyclopedia of Marine Mammals* is perhaps too comprehensive to be used as a set text for undergraduate students. To my mind, however, students beginning postgraduate study on marine mammals and researchers and academics working on marine mammals will find it indispensable (Lawler 2002).

The opposite situation where the encyclopaedia was not complex enough was also observed, as seen in the following quote:

The current level of detail was sufficient for general public but not necessarily for professionals (Kennard et al. 2005).

Sometimes, the problem was not so much a misjudgement of the level of the readership rather a misjudgement of their profile and areas of interest (Clements 2002), as illustrated below:

It [the *Encyclopedia of Basic Epilepsy Research*] may provide basic scientists with an overview of selected clinically relevant topics, and it was certainly not intended for clinicians (Loddenkemper and Zarowski 2010);

The question that immediately comes to mind is, for whom is the *Encyclopedia of Hormones* designed? The publishers have indicated in their publicity that this volume is designed to be read by non-endocrinologists ... It is difficult to imagine an individual with an interest in introductory information over such a broad range of endocrine topics. Instead, it seems best suited for wider usage, for example, by a biology department or library as a first source of endocrine information (Castracane 2003).

It was, however, rare that the encyclopaedia editors' claims regarding the target audience were considered totally incorrect. That was the case regarding the *Chemical Engineer's Condensed Encyclopedia of Process Equipment*, as van der Meijden (2001) wrote: "The value of the book for an engineer in actual practice is very questionable".

Worth: In many cases, the fact that some articles were considered valuable whereas others well considered less so highly affected the general worth of the encyclopaedias under review (Chisti 2000, Watkinson 2003, Windley 2006). In the

case of the *Encyclopedia of Ichthyology*, the reviewer (Bell 2004) even deplored the fact that this encyclopaedia was not essential publication and could be replaced by other publications on the market.

In a couple of instances, the reviewer criticised the worth of specific sections of the encyclopaedia. For instance, regarding the *Encyclopedia of Meat Science*:

As a biochemist interested in regulation of metabolism, I could not understand the relevance of James Bendall's papers on post mortem glycolysis. Why should anyone be interested in pH fall after an animal's death? (Enser 2006).

But the reviewers were not always as radical in their verdicts. In fact, in the case of the *Encyclopedia of Biodiversity*, the reviewer cautiously wrote:

it is too soon to know how well received by the scientific community this ambitious project is (Kareiva 2001).

Aesthetic value: Whenever the reviewers made mixed or negative comments about the aesthetic aspect of the encyclopaedia, these were all pertaining to the lack of the quality in the illustrations; particularly the insufficient use of colour (Carvel 2001, Laurent 2002) and to the unsatisfactory quality of the reproduction (Hartemink 2003).

Category 2. Encyclopaedia production

Production process: Here, mixed and negative comments were made pertaining not only to the editing process, but also to the choice of contributors.

In the case of the *Encyclopedia of Southern Appalachian Forest Ecosystems*, the reviewer identified issues with the way how the editorial team conducted the project:

It is my impression that the over 300 contributors have not been instructed in sufficient detail about what to write exactly and into what depth, and that the advisors and editors were not capable in maintaining a good overview of the incoming flow of manuscripts (van Loon 2006).

In the case of the *Encyclopedia of Hormones*, the reviewer was satisfied with the current production process; but he could, however, not refrain from emitting suggestions in the editorial team to maintain the same level of quality over time:

Relatively sophisticated staff is needed for long-term maintenance; otherwise, ESAFE could easily become obsolete (Kennard et al. 2005).

On the other hand, when the reviewers were not satisfied with the diversity of the contributors, their complaints were related to the fact that some countries were over-represented, often as a result of injudicious editorial choices:

A quick contributor headcount gives a community of 128 authors from some 15 countries. The bulk, 69, are located in the US, with 16 in Japan, 12 from Canada, seven from China, five each from Spain, Israel and Germany, while Belgium and the UK contribute two authors apiece, and Sweden, Portugal, Switzerland, Italy and India each has a single authority. It is thus, to all appearances, a very small community of 'foremost experts' which contributes to the 114 entries that make up the 11 categories (Anonymous reviewer on the Smart Encyclopaedia);

Most authors and members of the editorial advisory board are from North America, specifically the USA. This may reflect the network and preference of the editor-in-chief, the willingness and availability of US soil scientists to contribute, or some other reasons... One could argue that in this age of electronics it would not have been too difficult to spread authors a bit more evenly across the globe—provided there is merit in such spreading (Hartemink 2006).

Credentials of the contributors: Mixed comments were only seen in two instances. The first one concerns the review of the *Encyclopedia of Hormones* where the reviewer expressed mixed feeling about the credentials of the contributors based on the number of publications of some of the authors—a number which the reviewer judged rather small as indicated below:

Although most of the authors are of world-renowned stature, some are less well known. For example, a literature search for some authors and the topic of their chapters revealed only 3-4 publications on that topic, perhaps not the best choice for authorship (Castracane 2003).

In the second case—*The Whiplash Encyclopedia*—the reviewer (Méal 2006) accused the author of having “*a personal agenda*”—a fact which did not affect the level of expertise of the author but which was considered as a potential source of bias.

Category 3. Encyclopaedia content

Completeness: Here, reviewers found issues in terms of breadth and depth of subject coverage in the text but also issue with other encyclopaedia components such as the illustration, the glossaries, the index or the bibliography.

To start with the breadth of coverage in the encyclopaedia text, the reviewers often found one or two topics which –they thought– should have been included in the encyclopaedia under review (e.g. Bell 2004, Vercelli 2007, Zachos 2008). In the case of the *Encyclopedia of Cell Technology*, although the reviewer said that encyclopaedia is fairly comprehensive, he added that there were instances where the reader may need to consult another work, as indicated below:

Cell and product recovery technologies are weakly represented. A reader interested in these areas is strongly advised to also consult the complementary and much larger *Encyclopedia of Bioprocess Technology, Fermentation, Biocatalysis, and Bioseparation* (edited by M.C. Flickinger and S.W. Drew) produced by the same publisher (Chisti 2000).

But even in the encyclopaedias which were considered comprehensive, the balance between the various topics “could be lost” (van Loon 2006). Also, when the reviewers looked at specific examples of articles within the same encyclopaedia, it was not rare that they found inequality in the depth of coverage with some section discussed in more detail than others (Edwards 2003, Hartemink 2006). In some encyclopaedias, the subject treatment was generally considered “too succinct” (Bianchi Porro 2006) or “too short” (Vercelli 2007). In others, it was considered too descriptive and not enough technical (Das 2005) or it failed to encompass all perspectives, for example:

Some of the important topics have not received adequate coverage it deserves. One such example is that of ‘Air Pollution and Urban Studies’, though it is one of the major problems affecting the living organisms worldwide and despite the amount of research on the topic. The coverage on agricultural meteorology is modest at best and mostly confined to discussions of heat balance and derivation of eddy-covariance flux equation, which are also discussed elsewhere under companion sections such as boundary layer and others. This topic should have given more coverage with details on topics such climate variability in relation to vegetation, agriculture-specific weather forecast, crop-weather modeling, to name a few (Karipot *et al.* 2005).

Among the suggestions made by reviewers to improve the completeness of the content of the various encyclopaedia, there were “more research and case studies” (Kennard *et al.* 2005).

In fact, achieving both a wide coverage and satisfactory treatment in the text was not always possible, as in the following case:

depth is sacrificed for a reasonable amount of breadth of subject matter, intelligently chosen (Fisher 2009).

Also, there is a recurrent issue with the equality of treatment: some sections of the encyclopaedias were covered in relatively sufficient breadth and depth whereas other were not (Anonymous reviewer on the Encyclopedia of Atmospheric Sciences). It should be noted, however, that, the reviewers sometimes acknowledged that gaps in coverage and superficial treatments of some topics as understandable, if not unavoidable. For example:

Despite their thoroughness, however, the authors missed an important opportunity to expound on certain drugs. They did not, for example, provide information about dosage on the new drug fenoldopam mesylate. Likewise, enoxaparin, which is a widely used drug in the USA and elsewhere, was briefly mentioned and only in relation to heparin. Perhaps the difference in regulatory environment governing drug use between the US and the UK and market availability can account for this (Tang 2000).

By contrast to the gaps mentioned above, some reviewers complained that some encyclopaedias covered topics which were considered as unnecessary (Hartemink 2003). In the case of the *Encyclopedia of Electrochemistry* in particular, the reviewer (Berg 2003b) who looked at Volume 6 and Volume 9 but not only found some topics missing but also other topics which would be more appropriate for Volume 8 or 10 of the same encyclopaedia. There were also a couple of cases where overlap and redundancy in subject coverage were recorded (Barrett and Henzi 2005). The reviewer below explained:

Another problem is that of overlap between contributions, perhaps because two eminent authors, dealing with what are ostensibly different subjects, move their contributions to the same middle ground (Brookfield 2003).

Finally, the issues with completeness were not limited to the encyclopaedia articles. Indeed, in some cases, the glossaries was absent (Wanamaker and Grimm 2004), or –when it was present– had redundant entries (Castracane 2003). In other cases, it was the subject index (Skovgaard 2001) or the bibliography (van der Meijden 2001, Wilde 2002) which were absent. Regarding

the bibliographical references in particular, there were also occasional dissatisfactions regarding the type of reference used, as indicated by the reviewer below:

in some cases the list for further reading does not contain the most important key papers, but rather lists text books that do not contain significantly more information than is presented in the chapter (Wilhelm 2004).

Clarity: The clarity of the text could vary from one article to the other within the same encyclopaedia (Karipot *et al.* 2005). A couple of times, the reviewers complained about too lengthy articles which affected the clarity and conciseness of the encyclopaedia (Enser 2006, Hartemink 2006). Another time, the reviewers complained about the structure and presentation of the text:

At first glance some of the paragraphs look a little daunting, and extracting the meaning of the sentences from between the profusion of references is sometimes tricky (Rugg 2003).

Additionally, a small criticism regarding the illustrations was reported in the case of the *Encyclopedia of Atmospheric Sciences*, as indicated in the quote below:

Readers may not understand [the] figure, and it should be updated or explained further in the figure caption or text (Anonymous reviewer on the Encyclopedia of Atmospheric Sciences).

Accuracy: Once again, the reviewers found issues with not only the encyclopaedia texts, but also with the illustrations and references.

Some reviewers reported about grammatical errors, misspelling and typographical mistakes (e.g. Wilkins 2004, Enser 2006). But there were also misspelling of names and mismatching years in the reference lists (Chisti 2000, Hartemink 2006). Such mistakes were, however, never numerous; only one reviewer found them “rather annoying” (Williams 2001).

More alarming, factual inaccuracies were found; although, most of the time, the issue was limited to one or a small number of article within the encyclopaedias under review (Wilkins 2004). Sometimes, the issue was not so much an inaccuracy, rather an inconsistency in the presentation of the information. For example, the reviewer of *The Encyclopedia of Deer* wrote:

“the transformation of length and weight units (inches to mm and pounds to kg) is sometimes wrong or inconsistently carried out” (Zachos 2008).

In general, the reviewers' reaction varied according to the prevalence and the perceived degree of seriousness of the inaccuracy. For example, one reviewer qualified the single inaccuracy that he found as a “*surprise*” (Greenlade 2000). Another reviewer said he was “*disappointed*” and “*concerned*” that he found a few inaccuracies in the longest article in the encyclopaedia he was reviewing (Lord 2006). But the strongest and most negative comments came from the reviewer below - who listed several factual inaccuracies from a number of articles and ended up questioning the accuracy of the entire work:

I have some misgivings about the historical and technical correctness of a few of the entries.... And these are the topics that I know something about. How many errors arise in other topics with which I am not familiar? (Williams 2001).

On the other hand, issues with the accuracy of illustrations were found in three cases. In two cases, the illustration did not exactly match the text. In the *Encyclopedia of Meat Science*, the pictures were of “*machineries*” from the USA (Enser 2006) while the description in the text was more general. Regarding the *Encyclopedia of Atmospheric Sciences*, the reviewer wrote:

Fig. 1 in the article on Fronts contains a frontal boundary discontinuity which does not match up with the contours as they are drawn (Anonymous 2003).

In this last encyclopaedia, there were also issue with “*improper extension of credit*” for the illustrations used.

But the most virulent criticism regarding the clarity of the illustrations were found in the case of the *Chemical engineer's condensed encyclopedia of process equipment*. Not only did the reviewer find mismatch between the illustrations and the texts, but he also greatly complained about the reproduction of the illustrations which he judged “*really misleading*”. He explained:

a lot of illustrations have apparently been picked from other publications and have been adapted in size and/or form to fit the space. This has led to distorted equipment (ellipses instead of circles) and gives the impression that process equipment is full of ellipsoidal rotors, pulleys, vessels etc. (van der Meijden 2001).

Issues regarding the **reliability of the encyclopaedia content** were rarely reported. For example, in the case of the *Encyclopedia of Cell Technology*, although the claims were supported by extensive references, the reviewer complained that not enough details was provided for those who may want to read further because “*essential information such as the year of publication is*

missing” (Chisti 2000). Issue with the reference list was also reported in the quote below, along with complaints regarding the weakness of the argumentation:

There is little discussion regarding the evidence to support assertions. Most readers will be surprised to discover that there are no footnotes in individual subjects. At the conclusion of each topic the authors list “Further Readings.” However, the evidence-based clinician/scientist will need to look elsewhere for a comprehensive review (Wanamaker and Grimm 2004).

In fact, clearer examples of unreliable content were found regarding the Encyclopedia of Animal Behaviour where the reviewers (Barrett and Henzi 2005) explained:

The article, by Rupert Sheldrake, begins with the statement that 48% of dog owners and 33% of cat owners said that their pets responded to their thoughts. These kinds of ‘data’ are presented unquestioningly, which seems remiss given the results regularly thrown up by polls and questionnaires of this sort;

and

an entry by Anindya Sinha contains numerous large claims with absolutely no data, or even supporting references, to back them up.

More complaints were voiced regarding the **objectivity of the encyclopaedia content**, particularly regarding unbalanced representation of various views. In fact, there was often a general tendency to give more prominence to some views as opposed to others (Emery 2003), to fail to present classical views (Berg 2003a), or even be to be “one-sided in terms of content coverage, rather than presented as neutral, comprehensive topics” (Anonymous reviewer on the Encyclopedia of Atmospheric Sciences). In the case of *The Encyclopedia of Arthropod-Transmitted Infections*, the relatively limited space allocated to transmission almost moved the focus of the encyclopaedia in other areas, as illustrated by the example below:

We are told in the Preface that ‘the aim has been to present up-to-date information on the transmission of a broad range of infections’... But transmission is just one of the characteristics described for each infection. Where the topic is ‘Malaria, human’, the description of transmission occupies less than 10% of the article, while the description of anti-malarial drugs occupies almost 25%. Possibly this balance reflects the relative interest that is shown currently in these 2 aspects of malaria and the information that readers are likely to seek (Clements 2002).

In other cases, the encyclopaedias failed to have a multidisciplinary perspective. For example, a reviewer (Edwards 2003) wanted the *Encyclopedia of Soil Science* to provide an equal coverage of the biological, ecological and physico-chemical aspects of soil science whereas another reviewer (Chisti 2000) who reviewed the *Encyclopaedia of cell technology* –a work which is typically expected to be treated from a biological point of view - wanted an engineering perspective to be included.

A few encyclopaedias also failed to cater for an international audience by having content which was biased towards specific countries. In particular, some of the reviewers complained that some of the encyclopaedias were giving too much prominence to British and North-American issues (e.g. Jones and Columb 2004, Hartemink 2006, van Loon 2006).

Another failure of the science and technology encyclopaedias was related to the inappropriate coverage of scientific uncertainties and controversies. Indeed, a couple of times, the reviewers complained that encyclopaedia authors presented the science as more certain than it actually was by failing to signpost the presence of uncertainties, or by closing ongoing debates. Specifically, it was written about the *Encyclopaedia of Atmospheric Science* that:

no measuring device yields an output that is free of uncertainty. But knowing these uncertainties is critical to determining the bottom line. The answers to the aforementioned questions may be debatable, and we can no doubt have fun in discussing them. But they are necessary. As I understand it, the standard rain gauge is considered the primary standard for precipitation amount measurements despite its limitations during light or heavy rainfall periods, or under heavy winds.... Let that debate be resurrected (Anonymous 2003);

and about the Volume 9 of the *Encyclopedia of Electrochemistry* that:

In spite of the extraordinary amount of references several structural changes of DNA upon adsorption at the surface of the dropping mercury electrode (DME) and the mechanism of electron exchange are not yet fully understood, e.g., fast unwinding of the double helix or loosening only—that is still the question! (Berg 2003a).

The lack of objectivity in the encyclopaedia content was also due to some personal influences from the encyclopaedia authors, particularly when these latter work alone, as explained in the following quote:

It is clear that some topics (...) have received a great deal of attention from the author... This emphasis may be due to personal interest or expertise that he has in this area. Many other areas are covered equally well. However, other sections (...) seem to be underdeveloped... Given that a single author has put this work together, it is not surprising that some areas receive more attention than others (Kemerait 2006).

There were, however, a few cases where the authors were suspected to be using their encyclopaedia contributions as a way to spread their own ideas. These authors typically over-emphasised their own theories. Some authors even failed to acknowledge the existence of scientific consensus as reported in the quote below:

Alyn Brereton, presents his own ideas (the coercion-defence hypothesis) as received wisdom, which is by no means the case, and does not give due credit to other earlier work (or the fact that it is at least as well supported as his pet theory) (Barrett and Henzi 2005).

Generally, the damage was done only within one or two articles.

There also a few cases where the authors managed to push their personal agenda in many places within the same encyclopaedia. The following excerpt was taken from the review of the five-volume *Encyclopaedia of Geology* published in 2005 and it illustrates how creative the encyclopaedia authors could be in promoting their ideas:

There is a shortcoming that I think more serious. This concerns the article 'Time Scale' (by Gradstein and Ogg). Both authors are known for their activities in the International Commission on Stratigraphy, where they advocate a new time scale (without Quaternary, with many changes in the most commonly used names of series/epochs and stages/ages, and with a fairly drastic revision of the Precambrian). The new stratigraphic chart is still a proposal and discussions about it (among others at the 2004 IUGS conference in Florence) seem to lead to rejection of several of the Commission's proposals. It is therefore unfortunate that the new proposal is presented as the state-of-the-art, even more so because a simplified time scale on this basis is present on the inside back cover of each volume (van Loon 2006).

Most of the encyclopaedia authors who were indulging in self-promotion, were doing it either directly within the core text, as in the following example

Lukas Noldus provides an entry on computerized data analysis that, while broad and comprehensive, also manages to be an unabashed sales pitch for the products made by his company (Barrett and Henzi 2005);

or indirectly through the choice of references used to back up claims. That last practice was done by one of the contributors of the *Encyclopedia of Forensic Sciences* whose article had “very few internet links mentioned other than to its own site” (Carvel 2001). Similarly, one reviewer (Hartemink 2006) questioned the objectivity of the *Encyclopaedia of Soil Science* not because of the actual content itself, rather because of the bibliography used which was “mostly written by colleague soil scientists” and because of the tone and vocabulary used which had “a lot of praise and hallelujahs”.

In all cases, even the encyclopaedia reviewers acknowledged that it is difficult for the encyclopaedia editors to recognize authors’ hobby horses within the mass of encyclopaedia content, a challenge fully acknowledged by one reviewer (van Loon 2006) or to ensure that all views are appropriately covered within the encyclopaedia articles, particularly in the case of controversial topics such as evolution (Brookfield 2003).

Currency of the encyclopaedia content: Here, the reviewers mostly talked about the information within some of the articles to be out of date information, for example in the example below:

Also, there was talk that the oxygen flush could be locked-on to permit ventilation by lifting the mask off the patient's face. (Budgets must be tight if the authors’ departments still have anaesthetic machines where the flush can be locked-on!) (Greenslade 2000).

or, at least, to fail mentioning the latest technologies in the field (e.g. Berg 2003b, Karipot *et al.* 2005, Hartemink 2006). In one case, the reviewer (Lord 2006) also complained that the content of some articles only reflected the context of a few developing countries and ignored the more up-to-date information from the developed world.

It was rare that the reviewers’ criticisms were applied to an entire encyclopaedia, although that seemed to be the case of the *Encyclopedia of Animal Behaviour*, as explained by the reviewers below:

a good illustration of what we mean (by old-fashioned) is given by the biographical coverage of important figures... [by missing] number of the other individuals who have been central to the development of the field as it is today... While space is always at a premium, these omissions lend somewhat arbitrary air to the

provided biographies of...// the atheoretical emphasis tedious and whose enthusiastic rejection of its formalities makes it an old-fashioned technique to emphasize (Barrett and Henzi 2005).

The information within the article was not the only items susceptible to be of date. Complaints were also made regarding the bibliography which were considered “out of date” (Fisher 2009), “rather old” (van der Meijden 2001) “with considerable time lag” (Zehntner 2004).

There was an unavoidable time difference between the date of the latest information or the latest bibliographical reference and the year of publication, but sometimes, the reviewers considered that the time difference was not acceptable, depending on the topic. For example, a reviewer (Fisher 2009) found that a five year lag was too much in the case of the *Epilepsy A to Z: A Concise Encyclopedia*. By contrast, another reviewer (Lord 2006) considered that one year was too much in the case of the article on rapes from the *Encyclopedia of Forensic and Legal Medicine* which was published in 2005, as explained below:

The writer discusses the rape laws in different countries but does not mention the recent Sexual Offences Act 2003 in UK. This was fully operational by 2004 and I assume there would have been time to bring the article up to date.

Finally, there were complaints regarding the effort to bring the encyclopaedia content up-to-date (Desselberger 2009, Loddenkemper and Zarowski 2010), hence some suggestions regarding the necessity to develop online versions which would make such updates easier (Tang 2000).

There were much fewer complaints regarding the **stability of the of the encyclopaedia content**. In fact, only three instances were found in regarding the encyclopaedias reviewed in this chapter. The reviewer of the *Encyclopedia of Hormones* wrote that “the nature of this type of encyclopedia means that it becomes more out of date with the generation of each new piece of information” (Castracane 2003) whereas the *Encyclopedia of Forensic and Legal Medicine* will “go out of date quickly” (Lord 2006) and *The Encyclopedia of Deer* will “certainly not serve as a reference work for years to come” (Zachos 2008).

Informativeness of the encyclopaedia content: In order to improve the quality of the existing articles, the reviewers sometimes wanted some sections to be added or rewritten. For example, an “introductory article or preface for each

chapter” (Sparkman 2004), “an abstract summarizing each chapter” (Loddenkemper and Zarowski 2010), “a proper overview [instead of] a direct discussion of advanced topics” (Karipot *et al.* 2005).

On the other hand, the main information were also sometimes lost because the article failed to provide enough details (Fisher 2009), because there were contradictions between the various articles within the same encyclopaedias (Zehntner 2004), or because there were inconsistencies in the presentation as seen in the case of *Encyclopaedia of Geology* where the main text used the latest geological time scale whereas the bibliographical references used still referred to the old time scale:

the new proposal for a time scale should have been accompanied by references to the names currently in use. Without such a ‘correlation’ tool, much of the older literature will become inaccessible (van Loon 2006).

Sometimes, the reviewers wished that some components of the encyclopaedia (besides the main text within the article that is) were more developed; for example, the reviewer of the *Encyclopedia of Southern Appalachian Forest Ecosystems* (Kennard *et al.* 2005) wanted more bibliographic reference and links to be added. Other times, the reviewers wanted new components to be created such as a list of reference at the end of each article within the *Encyclopedia of Food Mycotoxins* (Skovgaard 2001), a list of further readings for *The Encyclopedia of Mass Spectrometry* (Sparkman 2004), or a list of the many abbreviations used in the *Encyclopedia of Virology* (Desselberger 2009).

The general lack or the absence of illustration to reinforce the content of the encyclopaedia was also deplored by some reviewers (Kemerait 2006, Vercelli 2007). In some cases, the reviewer wanted one specific graph or picture to be added. For example, a reviewer (Lord 2006) wanted “a diagram to explain rifled and non-rifled weapons” within the *Encyclopedia of Forensic and Legal Medicine*.

In addition, there were sometimes figures which did not have scale (Lord 2006). There were also cases where there were “so much detailed information in a small picture that they are unreadable” (van der Meijden 2001) as well as case of so poor quality that they lose their informational and educational values

(Enser 2006, Vercelli 2007). Finally, in the case of the *Encyclopedia of Molecular Medicine*, the quality of some illustrations decreased due to inconsistent use of colour and legends, as explained below:

150 of the 1000 illustrations are in colour, apparently without some contributors knowing as several black and white diagrams had colour codes which were redundant. Colour on all diagrams would have helped accessibility and improved the usefulness of this encyclopedia as a teaching aid (Laurent 2002).

Representativeness of the encyclopaedia content: Here, the reviewers' criticisms fell into two main categories.

First, some encyclopaedias were covering topics which were not usually discussed in other standard texts within the same field - for example articles on "Health" and on "Value to Humans" within the *Encyclopedia of Soil Science* (Hartemink 2003), or an article on "Career" within the *Encyclopedia of Animal Behaviour* (Barrett and Henzi 2005). In the case of the *Encyclopedia of Global Environmental Change*, the reviewer even wrote: "the relevance to global environmental change was not immediately obvious" (Watkinson 2003).

Second, some encyclopaedias did not follow the scientific standards and norms in use within the field. For example, in the case of the *Encyclopedia of Soils in the Environment*, inadequacies were found not only in the titles of the articles, but also in the content of the information provided, as explained in the excerpt below:

Some entries bear odd titles like Forest soils, Grassland soils, Paddy soils and Mediterranean soils. That may mean something to the laymen but for a soil scientist these are almost meaningless and should not be used as they single out only one of the factors of soil formation. For the same reason we do not use steep land soils, basalt soils or very old soils. Also the entry Spatial patterns is not exactly what you would expect as it is about biological properties and processes and their patterns" (Hartemink 2006).

In fact, the treatment of some topics was sometimes unexpected. Berg (2003b), for instance, identified metal electrodes as the "traditional" way to look at semiconductors in the whereas the Volume 6 of the *Encyclopedia of Electrochemistry* deals with "photoelectrochemistry from the point of view of light/sun interaction with semiconductor/electrolyte systems".

Finally, the non-respect of common practices within the scientific community could also affect the usefulness of the glossary as seen in the example below:

if the reader were not familiar with the full form of wording denoted by the initials “PSE”, which is not spelled out in many current papers, he might miss out since only “Pale, soft, exudative” occurs in the index(Enser 2006).

Category 4. Information retrieval

The reviewers’ criticisms mostly focused on the **effectiveness of arrangement of the encyclopaedia content**. Indeed, many reviewers reported difficulties in locating information by relying solely on the system in use. The few quotes below illustrate their frustration: you need to dig a little to get the best out the book (Butler 2004), you need some time to search through the articles scattered around the volumes (Lord 2006), and you need luck (Wilhelm 2004).

A reviewer complained that it was difficult to locate information when the articles were too long - for example a eight-page mini-review as opposed to a concise 300-words piece entry (Hartemink 2006). The same criticism was also made regarding the size of the table of content and Index (Bell 2004).

Other reviewers complained that some encyclopaedia authors sometimes used rather complex system of arrangement. For example, each volume of the *Encyclopedia of Global Environmental Change* begins with a group of extended essays which are followed by shorter articles (Watkinson 2003) whereas *The Encyclopedia of Separation Science* is structured using articles of three different levels (Haddad 2004). Also, the *Encyclopedia of Food Mycotoxins* used a peculiar system of asterisks (Skovgaard 2001) whereas in the case of the *Encyclopedia of Spectroscopy and Spectrometry*, each article has a two-line marking block below its title: a top line identifying the subject area, and a line just below indicating the category (Sparkman 2001). Such complex approach to content arrangement sometimes made information retrieval difficult, even more when no guidance was provided to the reader (Skovgaard 2001).

A few reviewers suggested other system of arrangement to improve information retrieval (e.g. Castracane 2003, Kennard *et al.* 2005). One reviewer even

recommended the development of a list of subheading in addition to the existing table of content and Index (Sparkman 2001).

Finally, regarding the place of the illustration within encyclopaedia, a reviewer complained about the *Encyclopedia of Forensic Sciences* and wrote:

Looking at the colour plates in the centre of each volume, it is not immediately obvious what chapter or text they pertain to” (Carvel 2001).

Regarding the search engines: Criticisms regarding the Table of content and Index, the cross-referencing and hyperlinks, as well as the search engines Even a simple alphabetical arrangement of the table of content has flaws, as the reviewer below found out:

the contents list brings together strange bedfellows: “Animal management” is followed by “Antibiotics”. Included in the latter is a section on the use of antibiotics in animal feedstuffs, followed by one on resistance in food-borne pathogens. The next topic is “Automation in the meat industry”. To overcome the fragmentation that the encyclopedia format produces, articles have been grouped.... but the grouping of topics appears somewhat quirky” (Enser 2006)

Moreover, such table of contents does not allow the readers to see how the various entries are grouped by themes within the encyclopaedia (Edwards 2003). In the particular case of the *Chemical Engineer's Condensed Encyclopedia of Process Equipment*, the arrangement of the Index was simply not done properly:

The equipment is listed alphabetically ... Unfortunately, this book does it on the adjective! For example, Twin Screw Extruders are found under T, while under the heading Extruders (under E) there is no reference to the existence of Twin Screw Extruders (van der Meijden 2001).

Category 5. Encyclopaedia delivery

Format: for encyclopaedia in book format, there was only one minor criticism, reported in the quote below.

The only criticism, which may be unfair and also applies to its predecessor, is that it would be useful for such an excellent guide to be pocket-sized. It is, however, intended as a reference book rather than a vade mecum (Jones and Columb 2004).

For electronic and online format: often, the reviewer are expressing that these alternative formats were not yet available (Tang 2000), should be or would be soon (Laurent 2002, Batjes 2007, Desselberger 2009). Talking about the *Encyclopedia of Forensic Sciences*, the reviewer wrote:

There is an internet link but this is for a “limited period” on purchasing these tomes. It is not stated how long this period is or why it is limited at all

User-friendliness: In one case, the reviewer complained about the size/weight of the multi-volume books which imposed impractical limitations:

At 5.5 kg (or 12.1 lb), the hardcover print version exceeds several airlines’ carry-on luggage restrictions (Loddenkemper and Zarowski 2010).

But it was the case of *The Encyclopedia of Separation Science* which was most criticised. Although the encyclopaedia editors compiled a clear and well-written “Guide to the use of the Encyclopedia” made available in the printed set, the reviewer complained that the guide was missing from the CD. Then, discussing the online version of the encyclopaedia, the reviewer (Haddad 2004) praised that information is now accessible via a search engine and articles can be downloaded as full text plus links or as PDF files for viewing or printing. Also other useful features such as such as emailing articles. But complained that it can take some time to download and view this information and that the PDF format does not contain links to other information.

Cost: judged overpriced considering flaws in quality (Carvel 2001, Watkinson 2003) or too expensive compared to the price of other encyclopaedias (Wanamaker and Grimm 2004), too expensive beyond the purchasing capacity of individual readers (Hartemink 2006, Butler 2007) and even sometimes beyond the budget of most libraries (Kareiva 2001, Laurent 2002). A common complaint is that encyclopaedia is “prohibitive for any potential reader” (Bianchi Porro 2006). So, sometimes, reviewers made suggestions on how to avoid paying the expensive price of printed encyclopaedia:

Individuals may want to consider to purchase the much cheaper on-line version (Hartemink 2003).

Conclusion

When compared to the recommendations on quality encyclopaedias (as described in Chapter 2), the expectations of the book reviewers on the science and technology encyclopaedias were often higher. It is true that, for some parameters, the reviewers downplayed or ignored some of the recommendations. That was, for instance, the case when the reviewers commented on the *purpose of the encyclopaedias* and overlooked the educational aspects of the work under review. By contrast, reviewers put much more emphasis on other aspects of some of the parameters. In a few instances, the reviewers even considered additional aspects which were not recommended for the quality assessment of general reference material. That was particularly the case for the parameters pertaining to the quality of encyclopaedia content (Category 3) as the reviewers did not limit their comments on the text within the articles but also looked at the illustrations and the references accompanying the articles as well as the encyclopaedia glossary and appendices.

Appendix4. List of book reviews considered for Chapter 9

- (2003) Encyclopedia of Atmospheric Sciences: James R. Holton, Judith A. Curry, John A. Pyle (Eds.). *Atmospheric Research* 66(4): pp.315-319.
- (2004) Encyclopedia of Energy. *Materials Today* 7(3): p49.
- Barrett L. and Henzi P. (2005) Marc Bekoff, Editor, Encyclopedia of Animal Behaviour Vols 1-3, Greenwood Press, Westport, Connecticut (2005) Pp. l+1274. Price £200.00 hardback. *Animal Behaviour* 70(6): pp.1440-1441.
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REFERENCES

Reference for the Introduction Chapter	295
Reference for Chapter 1. Theory of cognitive authority	295
Reference for Chapter 2. Theory of quality	298
Reference for Chapter 3. Methodology	300
Reference for Chapter 4. Historical background	303
Reference for Chapter 5. Previous research on <i>Wikipedia</i>	308
Reference for Chapter 6. Encyclopaedia industry	317
Reference for Chapter 8. Encyclopaedia development	321

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