The impact of computer usage on scholarly communication amongst academic social scientists

by

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A Doctoral Thesis
Submitted in partial fulfilment of the requirements
for the award of
Doctor of Philosophy
of the
Loughborough University

October, 1999

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ABSTRACT

The study aims to see whether there are differences in the nature and patterns of computer usage for communicating research between disciplines in the social sciences in Brazil and, if so, whether they can be related to factors which can affect the process of communication. The theory embedded in the research model states that pressures that accompany the introduction of information technologies into a university environment are significant factors in the use of such technologies. These pressures produce differences in the communication process itself. Furthermore, there may also be a relationship between individual factors and the use of IT for communication.

The research data were collected via a survey using two instruments. Firstly, mailed questionnaires were sent to 760 academic researchers in sociology and economics in Brazil, working in post-graduate programmes. A response rate of 64.1 percent was achieved. Secondly, 36 interviews were carried out with a sample of the most productive researchers in the two subjects studied. The interview sample included both respondents and non-respondents to the questionnaire. A small sample of 11 British academic researchers was included in the interview survey, in order to allow comparisons and see whether Brazilian academics lag behind IT front-runners.

Data collected revealed that there is an impact of computer usage on the scholarly communication process, especially in terms of informal communication. Such an impact can be related to changes in the social interactions that underlie knowledge creation among researchers, and also relates to differences in patterns and processes of computer usage between the chosen disciplines. Formal communication has experienced a gradually growing impact by electronic media on the well-established print environment, with the likely co-existence of the two media for some time to come. The results obtained showed that Brazilian researchers do not lag behind the British ones. Not many differences, but most similarities were found between economists and sociologists in both Brazil and the UK.

Keywords: Impact of IT; Scholarly communication; Electronic communication; Social scientists; Scholarly communication process; Brazil.

Dedications

To the ones I love so deeply,

My mother Lydia,

My husband Silas

My daughters Raquel and Rebeca

To the memory of my father Sebastião, an example of life.

ACKNOWLEDGEMENTS

All praise, glory and thanks to my God almighty, who preserved my life, and gave me strength, wisdom and peace to pursue my studies.

My special gratitude to Professor A. J. Meadows, my supervisor, for his constant patience, advice, guidance and encouragement. I have greatly benefited from his knowledge and experience. I should also thank Mrs. Janet Harrison, for her valuable support.

I also would like to thank Professor Cliff McKnight, my director of research, and Head of the Department of Information Science, for his support.

I am indebted to CAPES for the financial support throughout my PhD programme and for providing me with the data required to define my questionnaire and interview samples. I am grateful to Mrs. Vanda Lucena, for her prompt and kind replies to all my inquiries.

I also wish to thank my colleagues in the Department of Information Science and Documentation at University of Brasília, for approving my stay in the UK. A special thanks to Mrs. Marinez Trece for her kindness and her assistance with my questionnaires.

My thanks to all members of staff in the Department of Information Science at Loughborough University, for their encouragement and support.

My sincere gratitude to my friend Edilenice J. L Passos, for all she has done on my behalf during my absence from Brazil, and especially for her friendship, care and help. My warmest thanks to my friend Regina Marcia for her help and care with my work, and her constant prayers and support. Special thanks are also due to my dearest friend Dr. Liangzhi Yu, for her invariable care, prayers and encouragement. To 'Aunt' Deborah and Aparecida Guedes, my love and gratitude for her prayers and support.

Special and warm thanks are due to my dearest cousin and friend Elionora M. C. Barros, for the uncountable favours, strong spiritual support, valuable information about higher education in Brazil and constant encouragement and love.

My sincere gratitude is extended to my brothers and sisters from the *Igreja Memorial Batista* (Memorial Baptist Church), in Brasília, for their prayers, encouragement and spiritual support. Thanks to Rosber Almeida, for his faithfulness in keeping me well informed about our country. I would also wish to thank Richard and Pam Waters, Valerie Thompson, Joy Molyneux and John and Jean Blanshard for their constant encouragement and prayers here, in England.

My warmest thanks to my beloved family, whose distance was so hard to cope with. To may mother, my gratitude for her prayers, care and love. For her worries, my apologies. My gratitude to my Aunt Olga, for her love and prayers. To my brothers, sisters, brothers and sisters-in-law, my nieces and nephews my eternal love and gratitude for their constant support.

Finally, but so especially, my deepest gratitude to my beloved husband (Silas) for his love, encouragement, care and co-operation, which made this dream become smoothly true. To my lovely and beloved daughters (Raquel and Rebeca), my deepest appreciation and thankfulness for being so supportive, responsible, loving and faithful during my stay in England.

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Acronyms and Abbreviations

ACLS - American Council of Learned Societies

ANPEI - National Association for R&D in Industrial Enterprises, Brazil

BIREME - Latin America and Caribbean Centre on Health Science Information/ Pan American Health Organisation/ World Health Organisation, Brazil

BNDES - National Economic and Social Development Bank, Brazil

CAPES - Higher Education Personnel Training Co-ordination. Ministry of Education, Brazil

CCT - National Science and Technology Council, Brazil

CD-ROM - Compact Disk-Read Only Memory

CMC - Computer-Mediated Communication

CNPq - National Scientific and Technological Development Council. Ministry of Science and Technology, Brazil

COMUT - Document delivery service, Brazil

CONIN - National Informatics and Automation Council, Brazil

CWIS - Campus Wide Information System

EMBRATEL - Brazilian Telecommunications Enterprise

FAP - Research Support Foundation, Brazil

FAPERJ - Rio de Janeiro Research Support Foundation, Brazil

FAPESP - São Paulo Research Support Foundation, Brazil

FAPRGS - Rio Grande do Sul Research Support Foundation, Brazil

FINEP - Financing Agency for Studies and Projects. Ministry of Science and Technology, Brazil

FNDCT - National Scientific and Technological Development Fund, Brazil

FUNTEC - Technical and Scientific Development Fund, Brazil

GDP - Gross Domestic Product

IBRD - International Bank for Reconstruction and Development (World Bank)

IMF - International Monetary Fund

INFROSS - Investigation into Information Requirements of the Social Sciences

IPEA - Applied Economic Research Institute, Brazil

IT - Information Technology

LDB - Law of National Education Guidelines and Foundations, Brazil

MCT - Ministry of Science and Technology, Brazil

NISS - National Information Services and Systems, UK

OECD - Organisation for Economic Co-operation and Development

OPAC - Online Public Access Catalogue

PADCT - Scientific and Technical Development Programmes, Brazil

PBDCT - Basic Plan for Scientific and Technological Development, Brazil

PLANIN - National Plan of Informatics and Automation, Brazil

PND - National Development Planning, Brazil

PNPG - National Post-Graduate Plan, Brazil

PROIN - Programme for the Integration of Post-Graduate/Undergraduate studies, Brazil

PRONEX - Programme for Supporting Centres of Excellence, Brazil

PROTEM-CC - Multi-Institutional Thematic Programme in Computer Science, Brazil

R&D - Research and development

RHAE - Personnel Training for Strategic Activities Programme, Brazil

RNP - National Research Network, Brazil

S&T - Science and technology

SCIELO - Scientific Electronic Library Online, Brazil

SCP - Scholarly Communication Process

SEI - Informatics Special Secretariat

SNDCT - National Scientific and Technological Development System, Brazil

SOFTEX - Brazilian Society for Promoting Software Exportation

SOSIG - Social Science Information Gateway

UFRJ - Federal University of Rio de Janeiro, Brazil

UNDP - United Nations Development Programme

UNESP - São Paulo State University Júlio de Mesquita Filho, Brazil

USP - University of São Paulo, Brazil

CHAPTER ONE

INTRODUCTION

1.1 General overview

Over the last two decades, investigations into the use of computers by academic researchers have dominated the study of scholarly communication. The focus of these studies has been in accordance with the development of the technology. Accordingly, earlier studies (1970s) focused on the use of computers for information storage and retrieval. This usually related to the approach of intermediaries in the communication chain. With the increasing proliferation of computers in the academic environment, the use of computers by researchers themselves has become important. As a result, studies that focus on computer-mediated communication amongst researchers have grown progressively, especially during the 1990s when the use of networks has become commonplace and has brought about changes in the scholarly communication process. Scholarly communities of researchers constitute one of the main users of computers and networks. Moreover, communication lies at the heart of their activities. Therefore, these communities provide a fertile ground for studies of computer-mediated communication.

The present study is intended to provide an in-depth investigation of the impact of computer usage on the process of communicating research amongst academic social scientists (in the fields of economics and sociology) in Brazil, alongside some insights gained from a small sample of researchers in the UK. The impact is studied in terms of changes that may be occurring in the scholarly communication process relating interactions within the scholarly community. Academic social scientists in this present instance comprise scholars from the social sciences, working in a university department and involved in research. Social sciences constitute a division of knowledge which lies somewhere between the sciences and humanities. They

comprise a number of disciplines that deal with behavioural and social phenomena, and are concerned with human beings interacting. Although there is no complete agreement as to what constitutes the social sciences, many classifications include anthropology, economics, sociology, political science and psychology.

An in-depth study of a single discipline in the field appears to be useful because it can reveal more details. Furthermore, an investigation comparing two disciplines can provide useful insights for the field as a whole. It was therefore decided to compare two disciplines in this study -economics and sociology.

As social sciences, economics and sociology can be viewed in relation to a continuum that starts from the humanities, through the social sciences to the sciences.(1) Within this continuum (Figure 1.1), sociology lays in a central position, whereas economics tends to be closer to the science end.

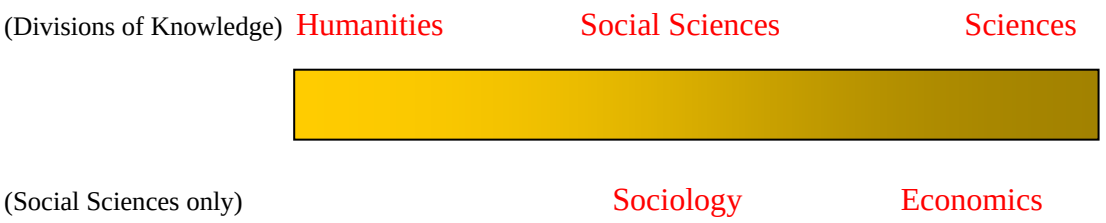

Figure 1.1
Continuum of the divisions of knowledge and the position of economics and sociology within the social sciences

1.1.1 Economics

As a scholarly discipline, economics is two centuries old. It had its beginning with Adam Smith's studies in the second half of the eighteenth century. Its common theme has been defined as "the study of how societies use scarce resources to produce valuable commodities and distribute them among different groups."(2) Within this broad subject matter, economics has been developed into a variety of specialisms. According to the American Economic Association subject index, currently used as the classification system for journal articles in the *Journal of Economic Literature*, the main sub-fields in economics are - general economics; methodology and history of

economics thought; mathematical and quantitative methods; microeconomics; macroeconomics and monetary economics; international economics; financial economics; public economics; health, education and welfare; labour and demographic economics; law and economics; industrial organisation; business administration and business economics, marketing and accounting; economic history; economic development, technological change and growth; economic systems; agricultural and natural resource economics; urban, rural and regional economics; other topics (cultural economics). Some of the sub-themes included, such as business administration, have, in fact, become specialised (interdisciplinary) fields, in terms of departmental organisation at universities, at least.

In order to carry out their studies and investigations, economics researchers need to draw upon historical records as well as recent ones, but in most of the cases they need very recent data. Many data used for research in economics are produced by national and foreign governments and international agencies. Researchers in economics must also deal with a number of analysis methods, especially statistical analysis. Journals constitute an important means of disseminating research. Communication amongst economists is good, owing largely to frequent attendance at conferences and the circulation of working papers.[3,4]

It seems that, because of the strong paradigmatic orientation from the American school of thought into the research within the field, and especially due to the influence of scientific methodology on its 'giants',[5] research in economics employs quantitative approach almost as a rule, through the use of mathematical and statistical methods. It does not mean that there are only econometricians in economics; though there have been discussions within the research community, concerning its classification as a social science as a result of such a pervasive quantitative approach, which brings it close to the mathematical and physical sciences.[1,5,6] Nevertheless, there has never been any doubt that it is a social science.

Economics was also selected because of the characteristic applicability that comes from its subject matter -the economic problems of society which, in turn, are affected by national and international decisions. This brings dynamism to the area. Major changes in society, in terms of production, techniques of organising resources and

distribution of wealth, occur both at the international and the national level and, as a result, changes in societal problems occur and need to be studied and solved. Besides its dynamism, economics, as a discipline, has an interdisciplinary approach. The professionals, either researchers or practitioners, need to handle different categories of information and need to be constantly up-dated, too. It makes economics a very interesting and useful discipline to investigate in terms of communication.

1.1.2 Sociology

Sociology was selected to provide a comparable, but contrasting field of study. It is the largest social science, and deals with social events, values, conditions and relationships. The word sociology was first used by August Comte in the early nineteenth century. Studies within the discipline, however, started developing more significantly during the second half of that century.(7) Since then, its development as a discipline has included some interesting paradigmatic changes and it has also diversified into a wide range of specialities. The categories used to organise the literature in *Sociological Abstracts* include - methodology and research technology; sociology history and theory; social psychology; group interactions; culture and social structure; complex organisation; social change and economic development; mass phenomena; political sociology/interactions; social differentiation; rural sociology and agriculture; urban sociology; sociology of language and the arts; sociology and education; social control; sociology of science; demography and human biology; the family and socialisation; sociology of health and medicine; social problems and social welfare; sociology of knowledge; community/regional development; policy, planning, forecasting; radical sociology; environmental interactions; poverty; violence; feminist/gender studies.

Sociology is another highly interdisciplinary area. It has especially stressed theoretical and methodological matters: its methods and theories have been used as research foundations in a number of other disciplines. At the same time, researchers in sociology make use of research methods and techniques from a variety of disciplines, including physical or life sciences, as well as behavioural sciences.

Sociology has an international dimension that can lead to international collaborative scholarship. Besides that, and because it has never been a politically or ideologically neutral field, changes that occur in those arenas tend to bring especial interest to the discipline.[8] This makes sociology an interesting discipline to study alongside economics.

Besides differences between sociology and economics, it is also possible to observe similarities between the two disciplines, especially because of the development of mutual interest research areas. Economic sociology, for example, has been studied to see whether there have been significant interactions between the 'dirty hands' and the 'clean models'.* The study of similarities in communication between the two disciplines can bring insights to the analysis of the social sciences as a whole.

1.2 Statement of the problem

There have been an increasing number of investigations being carried out to see how, and why, information technologies have been affecting scholarly communication. One of the main concerns relates to the exponential growth of world-wide electronic networks availability and all their related facilities. Within this context, it has been asserted that

> "**Electronic journals will be as superior to the print journal as the word processor is to the typewriter, or as electronic spreadsheets are to the calculator. However, we won't see much of this before the year 2000**".[10]

Although the assertion above is anecdotal, in the sense that it is not based on empirical research findings, it provides an interesting idea to be investigated. A number of other opinion papers and journal articles have pointed out that there have been changes within the scholarly community because of the use of computers for communicating research. Contributions to this discussion from other divisions of knowledge, i.e. sciences and humanities, may provide insights for possible

* The term 'dirty hands' refers to the fact that sociology relies mainly upon empirical research; 'clean models' relates to the heavy use of mathematical models in economics. [9]

generalisations about the relationship between the use of information technologies for communicating research within the whole scholarly community.

There is an increasing number of studies of the use of IT for communication amongst researchers in the sciences. A number of studies are also found regarding humanists. Much less emphasis appears to have been placed on the social sciences in the context of computer-mediated communication. Despite the considerable number of studies of information requirements and information-seeking behaviour and patterns amongst social scientists through the past decades, this scholarly community seems not to be receiving much attention from those involved in the study of the impact of information technologies on the scholarly communication process. Yet, since the three major scholarly communities, namely, scientists, social scientists and humanists scholars, show differences in their communication patterns, it is worth looking at each one of them to see whether such differences remain the same in a changing environment.

In summary, changes in the scholarly environment as a result of the introduction of information technology have come firmly on the agenda of research in information science over the last decade. As a consequence, a number of studies concerned with the impact of computer usage on the scholarly communication process have been carried out, but social scientists appear to represent something of a gap which needs to be bridged. Therefore, this study is an attempt to contribute to this discussion and bridge this gap by investigating social scientists within an academic environment. The main purpose is to see to what extent environmental and individual factors account for the use of computers and electronic networks for communicating research between economists and sociologists in Brazil and the UK, as perceived by themselves. In this sense, the study tries to find out whether the use of computers for communicating research relates to differences and similarities in the interactions within the scholarly community.

1.3 Aims, Objectives and General Hypotheses

The prime aim of this study is to see whether there are differences in the nature and pattern of computer usage for communicating research between disciplines in the social sciences in Brazil and, if so, whether they can be related to factors which can

affect the process of communication. Drawn from this aim, the main objectives to be achieved by the investigation are:

- To explore patterns of use of information resources by academic economists and sociologists in Brazil.

- To explore environmental factors which can influence differences and similarities in the use of computers and networks by economists and sociologists for research communication purposes.

- To explore individual factors that can influence differences and similarities in the use of computers and networks between academic social scientists for communication purposes.

- To identify differences and similarities in the interactions within the scholarly communities of economists and sociologists as a result of the use of electronic media for communicating research in Brazil.

- To identify changes that may be occurring in the scholarly communication process as a result of the use of IT by economists and sociologists in Brazil.

- To compare perceptions of the impact of the use of IT on the scholarly communication process by academic economists and sociologists in Brazil and the UK.

Based on these objectives, it has been hypothesised that:

- There are differences in the pattern of computer usage between economists and sociologists for communicating research in Brazil.

- Environmental factors such as social, economic and political pressures influence the use of computers and networks by academic economists and sociologists for communicating research in Brazil.

- Individual factors such as age, gender, mobility and seniority can affect the use of computers by academic economists and sociologists, which in turn can affect researchers' productivity, creativity and motivation.

♦ The use of computers and networks by academic economists and sociologists for communicating research can affect the scholarly communication process in terms of changes in the interactions within the scholarly community.

♦ Computer usage by academic economists and sociologists for communicating research can affect the scholarly communication process in terms of changes in its dynamics.

♦ There are differences in the perceptions of the impact of the use of IT on the scholarly communication process between economists and sociologists in Brazil and the UK.

1.4 Relevance of the study

There has been an increasing interest in the role the new information technologies are playing in the scholarly communication process, not least as a result of changes that have occurred in the technology itself, but also, and mainly, because of changing communication patterns. A future scenario for the scholarly communication process as a consequence of the use of IT has been examined in a number of papers and journal articles. Different arguments for different aspects of such an impact have been presented. Within this context, King has asserted that

> **"I also predict that … the electronic networks will grow; they will expand; for some activities, they will be preferred to the print medium, but they will not eliminate the print medium. We are facing evolution, not revolution. We will work with the new medium while continuing to use the existing media."**(11)

It seems likely that empirical research, which investigates whether or not those predictions are actually occurring by gathering data on the scholar's perceptions, should be able to cast light on this debate.

As noted above, there has been more emphasis on studies of scientists than of social scientists. It is therefore needful to carry out a basic examination of the attitudes and perceptions of social scientists (as represented in this study by economists and

sociologists). An analysis of the impact of information technologies is particularly important in a developing country such as Brazil, where a variety of pressures may lead to an under-utilisation of technological resources. Comparisons with a developed environment, such as the UK, should enrich the discussion and contribute to the generalisations.

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11. **Ibid.**, p. 6.

Figure 2.1

Map of Brazil

CHAPTER TWO

SCIENCE, TECHNOLOGY AND EDUCATION IN BRAZIL

2.1 Introduction

This chapter aims to provide a general picture of the Brazilian institutional framework and the government procedures for scientific and technological activities and for higher education. As it has been a government endeavour to plan, to implement projects and programmes, and to take major decisions for the development of these activities, the topics presented take account of this aspect. The reason for focusing on these two sectors only is that they constitute the prime background for the discussion of the issues related to the research topic. Nonetheless, information regarding a general overview in terms of geographical, historical and political characteristics is briefly presented.

2.2 General overview

2.2.1 Geography

Brazil is the fifth largest country in the world and the largest country in South America. It covers some 8,547,400 square kilometres, of which 93 per cent are in the Southern Hemisphere. The geographical position of Brazil creates boundaries which extend for 23,086 km, of which 7,367 km are with the Atlantic Ocean and 15,719 km with ten other South American countries. There are four different time zones in Brazil, from its oceanic islands to the western most territories.

The Brazilian Federation consists of 26 states together with a Federal District (Figure 2.1). They are grouped into five major regions: north (Acre, Amazonas, Amapá, Pará, Rondônia, Roraima and Tocantins), north-east (Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe and Bahia), centre-west (Goiás,

Mato Grosso, Mato Grosso do Sul, and Distrito Federal), south-east (Minas Gerais, Espírito Santo, Rio de Janeiro and São Paulo) and south (Paraná, Santa Catarina and Rio Grande do Sul).

2.2.2 Historical dates

Since 21st April 1960, Brazil's capital has been Brasília, which is also the capital of the Federal District. Before Brasília, the capital was Rio de Janeiro (1763 to 1960), and, from soon after the discovery to 1763 it was Salvador, in Bahia. Brazil was discovered by Portuguese navigators, on 22nd April 1500, and became a Portuguese colony. The name Brazil is derived from a ember-red colour of a wood, rare today but abundant when the country was discovered, named *pau-brasil*. Independence from Portugal was declared on 7th September 1822, and the country became an Empire. On 15th November 1889 the Republic was proclaimed and Brazil became a Federal Republic. The official name of the country, since then, has been the **Federal Republic of Brazil**.

2.2.3 Language

The official language spoken in Brazil is Portuguese, with a different accent from the Portuguese spoken in Portugal, as well as local speech peculiarities in each state. There are also a few linguistic roots restricted to indigenous areas: Gê, Tupi-guarani, Aruak and Karib.

2.2.4 Population

According to the figures available for 1996(1), Brazil's population totals 157,079,573 inhabitants who are mostly concentrated in the south-east (42.6 percent), north-east (28.5 percent) and south (15.0 per cent). The population density is 18.4 inhabitants per square kilometre. The number of females is slightly higher than males. In ethnic terms, the Brazilian population is a mixture of indigenous races, Europeans, Africans and Asians. Official statistics classify the population as 55.2 per cent whites, 6.0 per cent black, 38.2 per cent mixed origin (*mestiços, mulatos, etc*), 0.4 per cent 'yellow'

(basically Asian) and 0.2 per cent indigenous. Brazil is a Christian country, with a majority of Roman Catholics.

2.2.5 Currency

The currency in Brazil is the **Real (R$)**, established in 1994. The currency value is determined by the Central Bank of Brazil. The current exchange rate is R$ 3.14 per Sterling Pound. (24.09.99)

2.2.6 Democracy

Brazil is a democratic republic and has a presidential system of Government. The power is shared by three branches: the Executive, the Legislative and the Judiciary.

♦ The Executive Branch at the federal level consists of the President and the Vice-President, who are assisted by twenty Ministers of State and two Ministers Extraordinaires, plus eight Secretaries of State.

♦ The Legislative Branch at the federal level consists of the bicameral National Congress. The Chamber of Deputies represents the population as a whole and its members are elected by a system of distribution proportional to the population of each state and of the Federal District. The Federal Senate represents the states of the Federation and its members are elected by majority vote, three per state. At the state and municipal level, each state and municipality has its own Assembly.

♦ The Judiciary Branch consists of a highest court -the Federal Supreme Court- whose brief is to safeguard the Federal Constitution. It is composed of a panel of eleven judges appointed by the President of the Republic upon approval of the Federal Senate. It also consists of the High Court of Justice, the Military Court, the Federal Justice Council, the Election Courts (at federal and state levels), the Justice Court and the Work Court. There are also state Courts in each state.

2.3 Development planning

Despite having its current Gross Domestic Product (GDP) amongst the ten highest GDP in the world, Brazil is still classified as a developing country according to the world ranking indicators. This is mainly due to the low level of scientific and technological development in the country and poor social indicators, as compared to the most developed nations. Nevertheless, the Brazilian government has been taking a number of initiatives for at least six decades in order to promote growth and improve development. These have been made via national development plans, as the institutionalised mechanisms to guide decisions and actions and to establish priorities and guidelines.

Although the first initiatives regarding development plans in the country date back to the 1930s, they only led to partial implementation of specific undertakings. Therefore, until the end of the 1930s, economic and social development in the Brazil was not related to any central, comprehensive government plan.

2.3.1 The first centralised initiatives: from 1948 to 1964

It was in fact in 1948 that the first national development plan involving different subjects was proposed. It was named *Plano SALTE* (SALTE Plan) and concentrated on health, food, transport and energy, the primary needs of the country under concern at that time. SALTE is actually an acronym for these subjects in Portuguese and the word means a 'jump'. The SALTE plan was designed for the period from 1949 to 1954.

It is interesting to note that, in the history of Brazilian development planning, there are both gaps and overlaps. There are some single years that were not covered by any plan, and other periods of time in which more than one plan was proposed. Some of the overlaps, however, are due to changes in the authorities concerned, which always brought about new plans.

After the SALTE plan, a series of development plans were adopted by the government. From the Programme of Aims (1956-61) onwards, the Brazilian

development plans became increasingly comprehensive, thereby including an increasing number of subjects in their scope, despite the fact that there have obviously been different priorities for each period. Throughout the Military Regime, as a result of the government development strategies, there were institutional accomplishments in terms of planning and some important events in the scientific, technological and higher education arenas (see sections 2.4 and 2.5).

2.3.2 The Military Regime: from 1964 to 1985

A military revolution took place in Brazil in 1964, leading to a Military Regime that lasted from 1964 to 1985. Throughout this period, all the Brazilian presidents came from the Brazilian Army and the development planning activities in the country were institutionalised and established.

A special institution was created in the Ministry of Planning and Economic Co-ordination hierarchy, the EPEA (Applied Economic Research Office) in 1964. The 'Office' became an 'Institute' in 1967, changing its acronym to IPEA (Applied Economic Research Institute), with a very high reputation in the government, and continued with the co-ordination of the Brazilian development plans until the end of the 1980s.

It is worth noting that IPEA was responsible for carrying out the plan as an official document of the government, but all ministries contributed to the work, by presenting and discussing the priorities and programmes in their areas. Moreover, ministries and their attached organisations were responsible for the establishment and implementation of programmes and projects in their areas.

The First, Second and Third National Development Plans (PNDs) marked a fruitful stage of the planning activities in Brazil. It was especially true for the First and Second PNDs, as the Minister of Planning did not change for two successive governments and IPEA experienced a very strong period of national planning co-ordination. This helped to maintain reasonable institutional stability, a sine qua non condition for a development plan to succeed.

2.3.3 The New Republic: from 1985 onward

The first Brazilian President after the military period was José Sarney, a civilian who took charge of a democratic transition period. Though elected Vice-President, Sarney took the post because of the death of the elected President, Tancredo Neves. There was high institutional instability in the Ministry of Planning throughout President Sarney's mandate. Both the ministry itself and the minister in charge of the planning activities changed, along with the president of IPEA, bringing about two revisions of the national development plan. During President Sarney's mandate a new Brazilian Constitution was approved by the National Congress in 1988. It states that in the first year of its mandate each new government must submit a Multi-annual Plan (PPA) to the National Congress, containing the planned actions for all sectors.

The first Brazilian President elected by a direct ballot after the Military Regime and under the new Constitution rules was Fernando Collor de Mello, in November 1989. During his mandate, the Five-year Plan for 1991 to 1995 was carried out. Although President Fernando Collor was substituted by the Vice-President, Itamar Franco, because of an impeachment process, the plan was maintained for the rest of the period. It was co-ordinated by the National Department of Planning and Evaluation, under the Ministry of Economics, Finance and Planning.

The last federal government plan for Brazil was carried out during the government of President Fernando Henrique Cardoso, elected in 1994. It consisted of a Four-year Plan for 1996 to 1999, a document prepared by the Ministry of Planning and Budget. As President Fernando Henrique was re-elected in 1998, a new Four-year plan is currently being discussed by the National Congress for the period 2000 to 2003.

Planning activities in Brazil, as compared with the orthodox exercise that was carried out before, have been drastically weakened in the 1990s. IPEA was totally relieved of its planning activities, staying as a research institution responsible for preparing important studies on different subjects.

2.4 Science and Technology (S&T)

Some initiatives in S&T have been specially undertaken as part of general government plans. This process of institutionalising science and technology activities in Brazil, as a result of planned government actions, was not undertaken until the 1950s.

2.4.1 The institutionalisation of S&T in Brazil

One of the main reasons for the long absence of a S&T system in Brazil was the fact that Brazilian universities are very recent. It was actually in the twentieth century that our current major universities were founded: the University of Brasil, in 1922 (transformed into Federal University of Rio de Janeiro (UFRJ) in 1937), and the University of São Paulo (USP) in 1934, currently the largest. These initiatives were not related to any deliberate policy that looked forward to promoting scientific and technological development in Brazil.

In fact, it was only after the Second World War that a process of institutionalising scientific and technological development started to occur. From the 1950s, four major periods can be identified in this process and are useful to describe how the science and technology polices have been incorporated in the country.[(2)]

The first period: 1951 to 1964

The development model adopted in Brazil involved a high level of intervention by the State in every initiative. Therefore, initiatives for scientific and technological development in the country, as well as in any other area, have always been guided by government actions.

Over the period between 1951 and 1964, the science and technology endeavours of the Brazilian Government were aimed at training researchers and the creation and strengthening of research teams. The National Research Council (CNPq) was created, alongside the Higher Education Personnel Training Campaign (CAPES), both in 1951. A more comprehensive process for supporting scientific and technological

development started to appear, via two instruments implemented by these two institutions: scholarships and research funding. They envisaged, ultimately, the creation of a solid academic and scientific environment in Brazil.

The second period: 1964 to 1974

In 1964 CAPES, formerly a 'Campaign', was transformed into a 'Co-ordination', with a more significant and broader structure within the Ministry of Education hierarchy. Throughout this second period, the first attempt towards ruling science and technology in Brazil was actually presented in the ***Strategic Programme for Development***, the government plan for the period between 1968 and 1970, in which scientific and technological development was explicitly defined as an object of government policy. This second period was characterised by the creation of institutions and instruments that looked forward to responding to demands in the technology field, as described below.

♦ The Technical and Scientific Development Fund (FUNTEC) was created in 1964, under the supervision of the National Economic Development Bank (BNDE, currently BNDES). The main objectives of the fund were to pay for R&D activities and to train technical personnel for the national enterprise.

♦ The Financing Agency for Studies and Projects (FINEP) was established in 1969, along with the National Scientific and Technological Development Fund (FNDCT), which aimed to be the fundamental instrument for the support of scientific and technological development. Both the agency and the fund have been crucial for scientific and technological achievements in Brazil since then.

♦ The Brazilian Council for Higher Education defined and regulated post-graduate studies at Brazilian universities. Council Resolution 977 was passed on December 3, 1965 and adopted an American model of post-graduate training, which awarded 'Master' and 'Doctor' titles. Until then, there were only a few universities in Brazil where post-graduate training was performed. These followed an old French model and conferred only the 'Doctor' title.

♦ CNPq and CAPES proved crucial to the expansion and consolidation of post-graduate programmes at Federal universities in the 1970s: these increased from 125 in 1969 to 974 in 1979. This development was mainly due to the resources that came from FNDCT. CNPq became the governmental body responsible for formulating the national policy in science and technology.

One important achievement in this period was the reform of higher education in 1968, after almost a decade of intense debate on the so-called LDB - Law of National Education Guidelines and Foundations (Law 5,540, passed in 1961). This was when an orientation towards combining teaching and research by universities was highlighted. Another important achievement was the creation of the National Scientific and Technological Development System (the SNDCT), in 1964. Changes, re-definitions, and different institutional arrangements led to a current national system of science and technology, which includes universities and research centres from both the government and private companies.

The third period: 1974 to 1984

In 1974, CNPq, formerly The National Research Council, was transformed into The National Scientific and Technological Development Council (the acronym has been maintained), attached to the Planning Secretariat of the Presidency of the Republic, giving rise to a better integrated institutional arrangement. In another context, the Scientific and Technological Council (CCT) was created as a guiding body. The CCT is currently called The National Science and Technology Council and plays a central role in planning and co-ordinating the Federal Government's S&T actions. It was re-structured in January 1996, becoming a superior advisory to the President of the Republic. Accordingly, it has become responsible for formulating and implementing the national scientific and technological development policy.

This third period was characterised by intense planning in the post-graduate and research sectors. In relation to the government plans, it is important to draw attention to the periods covered by the First, Second and Third National Development Plans (I, II and III PNDs). The section of the I PND relating to scientific and technological development was detailed in a specific document, the First Basic Plan for Scientific and Technological Development (I PBDCT). Alongside the II PND and the II

PBDCT, the First National Post-Graduate Plan (I PNPG) was presented, within the scope of the National Post-Graduate System, and integrated with social and economic development policies. For the post-graduate area, the II PNPG was then proposed, covering the period between 1982 to 1985.

The fourth period: from 1984 to 1990

In the fourth period, between 1984 and 1990, two important developments can be identified. The first was the protection mechanism for informatics, instituted in 1984 and sustained throughout this period. This was concerned with protection of the national informatics industry, by implementing severe restrictions on the importation of computer equipment by government bodies. The policy led to the development of a national informatics industry, despite polemics about its results. The second one was the creation of the Ministry of Science and Technology (MCT) in 1985, aiming to strengthen the S&T institutional framework.

The First National Development Plan of the New Republic (I PND-NR, 1986-89) recognised the important role of the Government in the support of scientific and technological development. Accordingly, scientific and technological development actions were related to social needs, and fiscal incentives were awarded to selected areas, namely, informatics, biotechnology, fine chemistry, aeronautics, precision mechanics and new materials.

Over this period the sector that was mostly emphasised was informatics, which ended up having its own plan: the First National Plan of Informatics and Automation (I PLANIN), in 1986-1989. Likewise, normative and executive institutions were established, the National Informatics and Automation Council (CONIN) and the Informatics Special Secretariat (SEI), respectively. The main aim of I PLANIN was to consolidate the national informatics industry, establishing protective measures for some goods and services. On the other hand, there was no specific plan for science and technology as a whole.

In relation to post-graduate activities, the Third National Post-Graduate Plan was presented for the period between 1986 to 1989. The III PNPG was the only plan that

presented specific measures for the institutionalisation of research in Brazil.[3] Such measures included: to define specific amounts of money for research and post-graduate programmes within the university budgets, to re-structure academic staff careers in order to increase the importance of scientific production, to plan for and amplify university staff, to institutionalise sabbatical activities, and to stimulate internal assessment procedures in post-graduate programmes. Alongside the I PND-NR (and the III PBDCT), the III PNPG showed a major concern with the integration of science, technology and the productive sector. It also emphasised the regional disparity in Brazil, tackling the needs of research and teaching institutions in the northern region.

Two important programmes were launched by the MCT over this period. The first one was the Scientific and Technological Development Programme (PADCT), in 1984, which aimed to increase quantitative support for research, by introducing new criteria, mechanisms and procedures, and defining priority areas. It used two sources of funding: the Brazilian Treasury and the World Bank (IBRD), via loan agreements drawn up between the Bank and the Brazilian Government. The first phase of the programme, the PADCT I, was approved in 1985 and lasted until 1991, releasing a total of US$ 172 million for funding research, 42 per cent of which was financed by IRBD loans.

The second programme was the Personnel Training for Strategic Activities Programme (RHAE), in 1987, which aimed to widen and consolidate the Brazilian technological foundation on strategic themes, namely, informatics, biotechnology, fine chemistry, precision mechanics and new materials. The programme aimed to train professionals in these areas, by awarding them scholarships either for programmes within the traditional context of post-graduate training, such as Master and Doctorate, or for other programmes not necessarily related to these traditional post-graduate levels. Currently, the programme gives support to technological projects that assist the development of products and processes, as well as the amplification, improvement, and consolidation of the technological services infrastructure in Brazil.[4]

The 1990s

Research activities in Brazil are strongly related to post-graduate programmes, hence the two areas are presented jointly in this discussion. Throughout the 1990s, government action for the science and technology sector has been proposed in the two Multi-annual Plans presented so far. The plans contain a specific document for the area prepared by the Ministry of Science and Technology. Regarding the higher education sector, the guidelines in the document, 'Ten-year Plan of Education for All (1993-2002)' proposed by the Ministry of Education have been adopted. At present, a new National Plan of Education is under discussion in the National Congress. For the post-graduate programmes, CAPES has been struggling to finalise the IV PNPG.

In S&T, two basic principles have driven the objectives for the scientific and technological actions defined in the Five-year Plan 1991-1995: excellence in the scientific area, and competitiveness in the technology field.(5) Besides the general guidelines established, some specific ones were also defined. They included: research personnel training, support for scientific and technological research, technological. Moreover, the protection mechanism for informatics was ended, alongside the establishment of fiscal incentives given to enterprises that manufacture computer technology-related products.

The Four-year Plan for 1996-1999 also set specific targets for Brazil's science and technology policy. The general aim was to boost scientific and technological capacity as an essential means of attaining sustainable socioeconomic development.(6)

Although without a guiding plan since 1990, the Brazilian post-graduate sector has consolidated itself, as a result of a "stable and well-defined governmental policy".(7) The academic staff have been well trained, the post-graduate programmes have achieved a good quality level, and important research centres have been established both in the scientific and technological areas. Those have indeed been the achievements of the I, II and III PNPGs.

Throughout the 1990s, a number of programmes under CAPES, CNPq and FINEP co-ordination have been carried out. The major ones, in terms of funding for research and post-graduate programmes, are:

♦ PROIN - The Programme for the Integration of Post-Graduate/Undergraduate studies, launched by CAPES in 1995. It aims to reduce the distance between these two graduation levels, mainly by giving support to projects that aim at the improvement of undergraduate disciplines with the assistance of a post-graduate programme.(8)

♦ PADCT II (from 1991 to 1996), which expended a total of US$ 277 million, of which US$ 117 million came from IRBD loans. It is worth pointing out that PADCT has funded not only universities and research centres but also business enterprises.(9)

♦ PADCT III, designed to last from 1996 to 1999 and aiming to provide US$ 600 million, with 50 per cent provided by the IRBD. PADCT operates by a system of public tenders and is managed by the Special Programmes Department of the MCT in liaison with CNPq, FINEP and CAPES. Because of a financial crisis in Brazil, the programme was suspended by the MCT at the beginning of 1999.(9)

♦ RHAE, had a 'Basic Document' approved in December 1997 with the aim of helping to provide Brazil with better conditions of competitiveness in the world market. The programme constitutes one of the policy instruments of the Ministry of Science and Technology and is administrated by CNPq.(10)

♦ PRONEX, the Programme for Supporting Centres of Excellence, is a new funding line created in April 1996 by the MCT. The programme is administrated by a Co-ordination Commission nominated by the Minister of Science and Technology and is run by CNPq, CAPES and FINEP. It was designed to consolidate research groups of proven excellence that have obtained both national and international recognition.(11)

2.4.2 Research funding

Both Brazilian Government bodies and business companies have been funding research in Brazil. Funding from the Government is expended at both federal and state

levels. With regard to the business enterprise, funding is provided by both public and private companies.

As may be expected, the Federal Government has been the major source of financial resources for research in Brazil. According to the latest figures available,[12] the Brazilian total expenditure on S&T in 1995 stood at US$ 5,957 million, of which 47 per cent came from the Federal Government, 22 per cent from State governments, 22 per cent from private enterprises and 9 per cent from public enterprises. Such expenditures represent 0.88 per cent of the GDP, which, although unfavourable in terms of international standards, is one of the highest in Latin America, above Chile, Colombia, Venezuela, Mexico, Argentina and Ecuador.[13]

Federal government support

The organisational infrastructure that underlies this expenditure is based in the Federal Government and includes a wide range of institutions, since a number of ministries are involved in supporting S&T. Nonetheless, the main bodies are obviously the Ministry of Science and Technology and the Ministry of Education.

The Ministry of Science and Technology is currently (1999) being totally reformed in its structure. Despite such changes, the infrastructure for funding research has been maintained so far, and still includes two funding agencies: CNPq, mainly concerned with training and qualification of human resources and with support for research, and FINEP, which deals almost exclusively with financing industrial technology, besides acting as the executive secretariat for the FNDCT.

With regard to the Ministry of Education, the main funding agency is CAPES, which, in addition to its own budget, also administers three major funding lines -FNDCT, PADCT and PRONEX- together with CNPq and FINEP. CAPES also assists the Ministry of Education in formulating policies regarding post-graduate studies. One of its main purposes is to foster training through the granting of scholarships. The agency also maintains a standard of assessment for post-graduate programmes. Besides CAPES's resources, each Federal University has a specific amount of its own budget allocated to research and post-graduate programmes.

State government support

Article 218 of the 1988 Brazilian Constitution states that each state in Brazil can allocate a percentage of its budget revenue for the support of scientific and technological research. In reality, the majority of Brazilian States provide institutional support for science and technology via different mechanisms. Most of them have S&T Secretariats and legislation that guarantees resources for research. Some have established Research Support Foundations (FAPs). A few have created specific funds for research. These foundations have been amongst the major sources of funding for research in some states.

The biggest, earliest and most important state funding agency is the São Paulo State Research Support Foundation (FAPESP). Although the foundation was created in 1960 (despite being foreseen in the São Paulo's State Constitution in 1947), it only started operating in 1962. The foundation currently receives 1% of the tax revenue of São Paulo's budget. It is interesting to note that São Paulo is the richest State in Brazil, which benefits Sao Paulo's research institutions, especially the universities, compared to the rest of the country. The Brazilian States that have hitherto established a Research Support Foundation comprise: Paraná, Santa Catarina, Rio Grande do Sul, Rio de Janeiro, Minas Gerais, São Paulo, Maranhão, Piauí, Ceará, Paraíba, Pernambuco, Alagoas, Mato Grosso do Sul, Mato Grosso, Distrito Federal and Pará.

Private sector support

It has been difficult to gather data about the participation of the private sector in S&T expenditure in Brazil. The main source of data is the National Association for Research and Development in Industrial Enterprises (ANPEI) survey carried out in 1995. As stated before, such participation represented, in 1995, 22 per cent of the total S&T expenditure. Although this is an estimate, based on preliminary results from 500 firms responding to ANPEI's survey for that period (out of 700 expected), it reflects how this sector has been contributing to the total expenditure on S&T in Brazil.[14]

2.5 The educational system in Brazil

As stated before, research in Brazil is strongly related to the academic environment, since it is mainly carried out by researchers involved in post-graduate programmes offered by higher education institutions and a small number of research institutes. There are evidently other research institutions, both in the public and private sectors, that are concerned with carrying out research in Brazil. Nevertheless, higher education institutions represent the foremost environment for research in the country, especially the federal universities.

2.5.1 Higher education

Courses, programmes and their clientele

The variety of courses and programmes offered by higher education institutions are open to an equally varied clientele. These have been defined as:

- **Undergraduate courses**: open to applicants who have completed secondary school or equivalent, and who have been classified by a selective process.

- **Master and Doctorate programmes**, as well as **specialised and other post-graduate courses**, open to applicants with an undergraduate certificate and able to fulfil the requirements of the educational institutions offering the programmes/courses.

- **Sequential courses** in different fields and levels, open to applicants who are able to fulfil the requirements established by the educational institutions offering them;

- **Extension Programmes and Courses**, open to applicants who are able to fulfil the requirements established by the educational institution offering them.

Institutions

Higher education is offered by public and private institutions, but varies according to both the comprehensiveness of the subjects covered and the activities performed. Accordingly, higher education institutions can be divided into universities, 'integrated

faculties' and 'isolated establishments'.* Universities are entitled to promote, alongside higher education, basic and applied research, as well as community services offered through their extension programmes and courses. Integrated faculties concentrate on a few subjects and so do isolated establishments. Most research activities are carried out in universities, although they can also be found in a few isolated establishments. There are federal universities in each state in Brazil, except Tocantins, which has a state university only. Some states have more than one federal university, which leads to a figure of 39 institutions in 25 states and the Federal District.

Statistics

The latest statistics on higher education available[15] are summarised in Tables 2.1 to 2.4 and show that, in 1996, there were 922 higher education establishments in Brazil, 14.8 per cent of which were universities, 15.5 per cent were integrated faculties and 69.7 per cent were isolated establishments. In terms of affiliation, 22.9 per cent were public (6.2 per cent federal, 8.0 per cent state and 8.7 per cent municipal) and 77.1 per cent were private institutions.

With regard to the number of courses offered, there were 6,644 undergraduate courses being offered by those institutions -62.7 per cent by universities, 12.8 per cent by faculties, and 24.5 per cent by isolated establishments. In terms of affiliation, 23.8 per cent of the courses were offered by federal institutions, 14.5 by state institutions, 6.5 per cent by municipal institutions and 55.2 per cent by private institutions. As regards the fields of knowledge, 39.6 per cent of the courses were in science and engineering, whereas 60.4 per cent were in social sciences, humanities and arts.

* Higher educational institutions with a limited scope of subjects and activities.

Table 2.1

Higher education institutions, by region and affiliation (1996)[15]

Affiliation	**Number of institutions**						
	North	North-east	South-east	South	Centre-west	**Total**	**%**
Federal	8	13	23	9	4	**57**	**6.2**
State	3	16	22	19	14	**74**	**8.0**
Municipal	1	11	42	13	13	**80**	**8.7**
Private	22	57	488	81	63	**711**	**77.1**
Total	**34**	**97**	**575**	**122**	**94**	**922**	**100.0**

Table 2.2

Higher education institutions by region and type of establishment (1996)[15]

Type of establishment	**Number of institutions**						
	North	North-east	South-east	South	Centre-west	**Total**	**%**
University	9	26	62	29	10	**136**	**14.8**
Integrated faculty	4	10	103	10	16	**143**	**15.5**
Isolated establishment	21	61	410	83	68	**643**	**69.7**
Total	**34**	**97**	**575**	**122**	**94**	**922**	**100.0**

Table 2.3

Higher education institutions, by affiliation and type of establishment (1996)[15]

Type of establishment	**Number of institutions**					
	Federal	State	Municipal	Private	**Total**	**%**
University	39	27	6	64	**136**	**14.8**
Integrated faculty	-	4	7	132	**143**	**15.5**
Isolated establishment	18	43	67	515	**643**	**69.7**
Total	**57**	**74**	**80**	**711**	**922**	**100.0**

Table 2.4

Number of undergraduate courses, by region and field of knowledge[15]

Field of knowledge	**Number of courses offered**						
	North	North -east	South -east	South	Centre-west	**Total**	**%**
Exact and earth sciences	79	175	489	239	88	**1,070**	**16.1**
Biological sciences	16	26	79	32	23	**176**	**2.6**
Engineering and technology	25	70	276	103	19	**493**	**7.4**
Health sciences	28	105	360	152	40	**685**	**10.3**
Agricultural sciences	17	37	85	53	18	**210**	**3.2**
Social sciences	87	246	956	435	162	**1,886**	**28.4**
Humanities	105	243	591	297	133	**1,369**	**20.6**
Linguistics and arts	52	129	344	152	74	**751**	**11.3**
Basic cycle	**-**	**-**	4	**-**	**-**	**4**	**0.1**
Total	**409**	**1,031**	**3,180**	**1,463**	**557**	**6,644**	**100.0**

As can be inferred from these data, most of the private higher education institutions are isolated establishments, whereas the majority of the federal institutions are universities. Such figures correspond to the educational policy adopted in the country by the federal government over the last three decades. This has encouraged the establishment of higher education institutions in the private sector, as a response to the increasing demand for places in higher education establishments. This growing demand, along with the reluctance of government to increase offers in public institutions, has given rise to a favourable market for private initiatives.

There are obviously a number of requirements for such establishments to be (or to become) a university, or even a faculty. However, the amount of resources necessary for establishing an isolated establishment is much smaller than for creating a university. Since this is a process that takes time to develop, it is understandable why there are so many more private 'isolated establishments' than faculties or universities. They are always more likely to start providing courses on one or more specific subjects and then develop towards a more comprehensive institution. For instance, there were 20 universities, 19 school federations/integrated faculties and 643 isolated establishments in the private sector in 1980; in 1996, the figures were 64 universities, 132 school federations/integrated faculties and 515 isolated establishments.[16]

An historical overview indicates that, since its earliest times, i.e. the Empire period, the higher education organisational standard adopted in Brazil has been based on the accumulation of isolated higher schools. This was the case for the first Brazilian university, the current Federal University of Rio de Janeiro, created in 1922 by the congregation of isolated higher schools. The creation of the University of São Paulo, in 1934, was an innovation in this context, as was the creation of the University of Brasilia, in 1961, which is regarded as a "prototype of the modernisation movement for higher education in Brazil".(17)

Higher education institutions are accredited by the National Education Council at the federal level, and State and Municipal councils at those levels. According to the new LDB, such an accreditation has a limited duration and must be renewed periodically, after an evaluation process. Post-graduate programmes and courses are assessed exclusively by CAPES.

2.5.2 Post-graduate training

The post-graduate model adopted in Brazil (the American one) was implemented by the end of the 1960s. At that time it was concerned with Master and Doctor degrees only. Since then, the Brazilian federal government has invested heavily in the training of post-graduate personnel. Accordingly, there has been a continuous increase in the number of scholarships granted by CAPES and CNPq for post-graduate studies both in Brazil and abroad. In addition to that, there has also been an increasing support for the development of the infrastructure necessary for postgraduate courses accredited by CAPES.

Over the last three decades, there has been a reasonably consistent development of the Brazilian post-graduate system, as a result of a purposeful policy from the federal government. From some tens of courses at the beginning of the 1970s, the system accelerated, leaping to c. 1,000 courses by its end.(18) It is worth adding that, alongside the long-term programmes (Master's and Doctorate), postgraduate studies nowadays also include a number of short-term courses, particularly the 'specialised' ones, which award a qualification. However, most of the effort made by the higher education institutions that offer post-graduate programmes is concentrated on the long-term

programmes, which are clearly more valued by government policies. Post-graduate training also includes the post-doctorate programmes, which, though not necessarily considered as a qualification, have been increasingly promoted within the academic environment.

A recent discussion has drawn attention to one feature of the post-graduate programmes in Brazil -that most of their staff are clustered in the age-range above 40.[19] Such a characteristic is seen as a consequence of at least three factors. Firstly, the Master's degree is a prerequisite for the Doctorate and is itself concerned with research, which requires an extended period of time to complete. Secondly, there is a fixed number of credits that must be completed as a prerequisite for the thesis work in both the Master's and the Doctorate programmes. This again requires an extended period of time to complete. Finally, the selective process amongst the applicants gives preference to accumulated knowledge and background, which in turn favours more experienced professionals as candidates.

Institutional aspects: figures and comments

Post-graduate programmes in Brazil are offered by a variety of institutions throughout the country, though a higher concentration is found in the south-east region, followed by the south and then the north-east. The smallest number of programmes is in the northern region, as is shown in Table 2.5 below. These figures are in proportion to the population distribution in the country. However, in relation to the south, which has a smaller population than the north-east, the number of programmes, besides being larger, represents double the number of the north-east doctorate programmes. Regional disparities -observed in so many ways in Brazil- are actually, and unfortunately, a strong characteristic of the post-graduate activities in the country.

Table 2.5

Post-graduate programmes by region and institution affiliation (1997)[20]

Affiliation	**Number of programmes**						
	North	North-east	South-east	South	Centre-west	**Total**	**%**
Federal	28	174	330	164	67	**763**	**59.1**
State	-	10	376	24	-	**410**	**31.8**
Private	-	1	86	29	2	**118**	**9.1**
Total	**28**	**185**	**792**	**217**	**69**	**1,291**	**100.0**

Data shown in Table 2.5 relate to masters and doctorates only, i.e. do not take into account specialised and other post-graduate courses. These statistics relate to post-graduate programmes accredited by CAPES up to 31st December 1997. There is currently one accredited programme offered by a municipal institution, but it was accredited after that date.

It is worth emphasising that, out of the 410 post-graduate programmes offered by state institutions, 91.7 per cent are in the south-east region, and 86.6 per cent are in São Paulo alone. Moreover, out of the 355 programmes offered in São Paulo, 21 per cent are offered by one institution (the São Paulo State University Júlio de Mesquita Filho -UNESP) and 59 per cent by another (University of São Paulo -USP), both of them offering programmes on different sites in a number of towns within the state. These two institutions together offer 22 per cent of the total post-graduate programmes in Brazil.

There was a total of 128 institutions in 1997 providing post-graduate training (Table 2.6). It is interesting to note that 25.8 per cent of private institutions offer only 9.1 per cent of the total programmes.

Table 2.6

Number of institutions providing post-graduation programmes, by region and affiliation (1997)[20]

Affiliation	**Number of institutions**						
	North	North-east	South-east	South	Centre-east	**Total**	**%**
Federal	4	14	25	8	4	**55**	**43.0**
State	-	4	31	5	-	**40**	**31.2**
Private	-	1	21	9	2	**33**	**25.8**
Total	**4**	**19**	**77**	**22**	**6**	**128**	**100.0**

With regard to the different fields of knowledge, there is a higher concentration in STM programmes than in social sciences and humanities, as can be observed in Table 2.7. The largest number of post-graduate programmes offered is in the health sciences, followed by the exact and earth sciences, and the agricultural sciences. Before the modifications implemented in 1997, the third largest number used to be in the biological sciences.

Table 2.7

Post-graduate programmes by region and field of knowledge (1997)[20]

Field of knowledge	**Number of programmes**						
	North	North-east	South-east	South	Centre-east	**Total**	**%**
Exact and earth sciences	5	31	89	26	10	**161**	**12.5**
Biological sciences	6	18	79	19	7	**129**	**11.5**
Engineering	3	19	89	23	8	**142**	**11.0**
Health sciences	1	31	225	36	6	**299**	**23.1**
Agricultural sciences	6	18	92	36	6	**158**	**12.2**
Social sciences	1	21	56	20	8	**106**	**8.2**
Humanities	4	26	101	34	16	**181**	**14.0**
Linguistics and arts	1	9	42	10	4	**66**	**5.1**
Multidisciplinary	1	12	19	13	4	**49**	**3.8**
Total	**28**	**185**	**792**	**217**	**69**	**1,291**	**100.0**

These figures give an idea of how post-graduate training in terms of masters and doctorates have been offered in Brazil, showing a higher concentration of programmes in public institutions, particularly in the federal universities. This high

concentration reflects the lack of commitment from the private sector education entrepreneurs to invest in post-graduate training. It also appears to be related to funding, which, in turn, is concerned with quality. A few private establishments, however, including the pontifical catholic universities and some 'isolated' ones, are outstanding institutions.

Both the accreditation procedures and the consequent periodic assessment of the existing programmes are extremely strict. In fact, the assessment of the programmes has been considered one of the factors leading to the success obtained by Brazilian post-graduate activities, and reveals a clear consolidation of their initial foundation along with improvement in quality.[21]

Evaluation criteria include basically the assessment of infrastructure, staff graduation, scientific productivity, capacity for training masters and doctors, etc. It is also concerned with international standards shown by the programmes. It is worth noting that the previous ranking extended from 'A' (the highest) to 'E' (the lowest). The current ranking ranges from '7' (the highest) to '1' (the lowest), with '3' the lowest mark acceptable.

Summary

The figures concerning post-graduate activities cast a light on the discussion of higher education as a whole. Although there is a large number of higher education institutions in the private sector, they have not been concerned with post-graduate studies; these studies are mostly concentrated in the public universities. As research in the country is mostly carried out at higher education institutions that offer post-graduate programmes, it also indicates that higher education private establishments are not concerned with research, either. The contribution of private sector education to the scientific and technological development in the country is more concerned with undergraduate training.

2.6 The National Research Network

The academic environment, as the primary arena for research, is obviously the prime milieu for scholarly communication. Accordingly, the introduction of the Internet for academics at universities in the early 1990s took this into account, providing a technological infrastructure for them to communicate more effectively. The first independent embryos of the network in the country started to be implemented in 1988, connecting big universities and research centres in Rio de Janeiro, São Paulo and Rio Grande do Sul with the USA. With the objective of integrating these efforts and co-ordinating a national network in the academic context throughout the country, the Ministry of Science and Technology established a committee with representatives from CNPq, FINEP, FAPERJ, FAPESP and FAPRGS. The last three are the state foundations of Rio de Janeiro, São Paulo and Rio Grande do Sul, respectively. The aim of the committee was to discuss the establishment of Internet facilities in Brazil. As a result of their work, and following the world-wide trend, the Internet was launched in Brazil in 1989, via the establishment of the National Research Network (RNP) project, a national consortium funded by CNPq with support from the United Nations Development Programme (UNDP).[22]

2.6.1 Contextualising

RNP is one of the priority programmes of the MCT, supported and executed by CNPq. It is actually part of the current national informatics policy, which has been adopted since 1991 and focuses on a strategy of international market insertion. This new policy is opposed to the previous one, in which a protective mechanism was adopted for the sector. This allowed Brazil to develop the largest informatics and telecommunication industry in Latin America. Besides that, the contingent of graduate professionals in the country is the highest in the region. However, because of this protective policy, there was no competition for the Brazilian informatics industry. The new model aims to achieve competitiveness and is based primarily on scientific and technological development. There are three priority programmes proposed by the MCT for the informatics sector.[23] They are:

- The Multi-Institutional Thematic Programme in Computer Science (PROTEM-CC), whose main aims are, firstly, to strengthen the national technological capacity via co-operative research, and secondly, to intensify the process of training experts to supply the requirements of the industrial sector;

- The Brazilian Society for Promoting Software Exportation (SOFTEX 2000), which aims to transform Brazil into a centre of excellence for producing and exporting software, according to international standards of quality and productivity; and

- The RNP programme, which aims to contribute to the implementation and dissemination of the Internet, its applications and technology in Brazil. Its main mission is to operate an Internet backbone service designed primarily for the academic community, as a support network for education and science.

2.6.2 RNP Phases I, II and III

The period from 1991 to 1993 constituted the first phase of the project and was devoted to building the backbone phase I of the RNP. In 1993 the network was accessible in eleven states, with connections of 9.6 and 64 Kbps. At this stage, the Internet was restricted to academic activities.

The second phase was carried out from 1994 to 1996 and was devoted to the development of the RNP backbone phase II, with a much speedier infrastructure, including 2Mbps connections. Such an improvement aimed to satisfy an increasing demand upon the RNP backbone as a result of an increasing number of institutions being connected to the network. At this stage, the RNP expanded its role. The backbone stopped being restricted to the academic environment only and expanded access to different sectors of society, offering important support to the consolidation of the commercial Internet in Brazil. Since then, a number of private companies that produce computers and periphery equipment have started giving support to the network, providing equipment, software and even funding some activities.

It is worth noting that, from the time when the commercial Internet was launched, a number of other backbones have been implemented, the largest one by the Brazilian Telecommunications Enterprise (EMBRATEL), which connects more than 110

locations throughout the country, using high-speed connections. As a result of such expansion, the Internet in Brazil has experienced exponential growth. According to the most recent statistics available, (relating to January 1999), Brazil occupies the 17th position in the World, the 3rd position in the Americas, and the 1st position in the South America for the number of hosts.(24)

Between 1996 and 1998, the RNP improved its infrastructure considerably. The current backbone has a total of five international connections, as well as connecting twenty-six Brazilian states, linking tens of thousands of computers in more than 800 institutions throughout the country (Figure 2.2). In its third phase, the RNP project, besides ensuring the maintenance of its backbone, gives support for the establishment of the RNP2. The main aim of the RNP2 is to stimulate the development of a new generation of Internet networks in the country, allowing Brazil to integrate the American initiative 'Internet2' and the European initiative 'TEN-155'. In this sense, a recent collaborative initiative between RNP and PROTEM-CC aims to promote the implementation of High Speed Metropolitan Networks in the Brazilian states. This collaborative work has promoted the establishment of a number of consortia comprising universities and research centres, as well as telecommunication and other private companies.

Research activities in Brazil have benefited from the Internet. Research centres and higher education institutions have been making extensive use of the network through the RNP backbone. As a consequence, most of the Brazilian researchers, especially academics, have been able to access and exploit the resources available on the network.

2.7 Conclusion

Scientific and technological development as a result of R&D activities is a principle that has been underlying Brazilian governmental plans and programmes over the last three decades. It has been implemented via institutional mechanisms that have included central government planning and stable policies, particularly in relation to post-graduate training. Despite institutional changes that have taken place, especially in the S&T sector, some positive results can be identified.

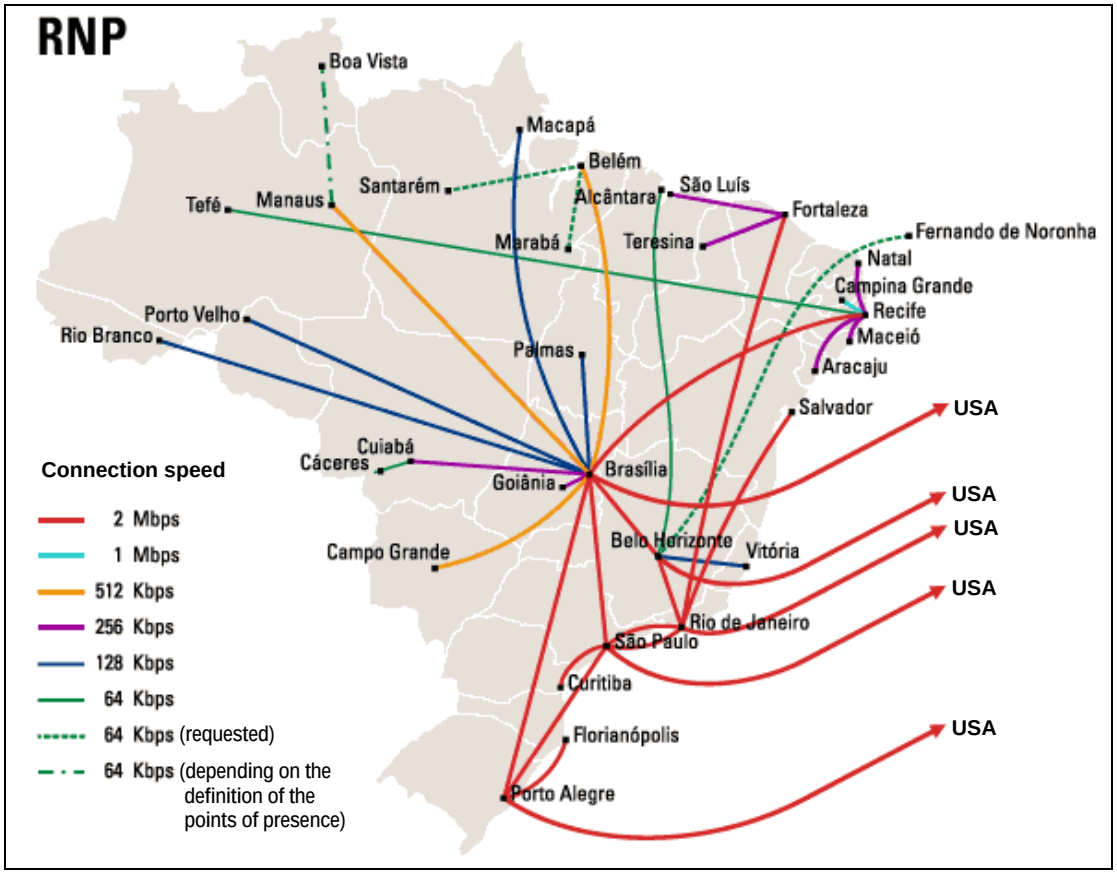

Figure 2.2

The National Research Network (RNP) backbone

In relation to the post-graduate sector, the results of the I, II and II PNPGs can be observed. This policy has led to academic (university) staff training, good performance of post-graduate programmes, and the development of research within the university environment. The Brazilian post-graduate model is currently under scrutiny, via a wide discussion about its future course, in view of the major changes that are occurring in contemporary society. The central issue is flexibility, which should take into account the rapid advancement in knowledge and its technological application to economic and social change.

With regard to S&T activities, positive changes have been attributed to the Brazilian planning experience. In this sense, it has been observed that

> **"The more significant adjustments of the organisational structure for scientific and technological activities, as well as the qualitative advancements, have occurred in the periods in which a more global government planning action has been valued."**(25)

Due to structural changes that are currently being made in the S&T sphere in the Brazilian federal government, alongside the recent financial crisis in the country, a heated debate has been taking place, particularly within the academic environment. If there was not such a financial crisis, the three following factors would lead to a positive perspective:

♦ The guidelines proposed in the multi-annual plans by the federal government, both for higher education and science and technology;

♦ The increase in state government support for science and technology via the establishment of the institutional framework necessary for that, i.e. FAPs and S&T secretariats; and

♦ The upward participation of private sector enterprises in R&D activities.

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CHAPTER THREE

THE STUDY OF THE SCHOLARLY COMMUNICATION PROCESS

3.1 Introduction

The scholarly communication process is a complex one, and its study comprises a range of topics depending on the focus chosen. It can include: the process itself as a whole; one specific function of it; the scholars as authors/producers and/or readers/users; other actors such as librarians and publishers; the scholarly community as the arena for scholars' interactions; the information infrastructure in terms of information channels and sources; computer-mediated communication; etc. Each of these topics also presents a diversified range of aspects leading to a variety of studies. This section covers three main aspects of the scholarly communication process as important to the discussion of issues related to the present research.

Firstly, it deals with issues regarding the scholarly community. It presents a brief discussion about the concept of community in order to see how communities have been theoretically defined within different disciplines. It also explores the discussion of the scholarly community in different contexts, as well as the definition of its possible boundaries. The current discussion about virtual scholarly communities is also briefly analysed.

Secondly, there is an analysis of the scholarly communication process itself. It starts by analysing theoretical frameworks for its study. In addition, the discussion of differences between the main divisions of knowledge as regards communication patterns is briefly explored. The analysis of previous studies available in the literature is then presented.

Finally, current knowledge of the impact of information technologies on scholarly communication is analysed. The analysis concentrates on computer-mediated communication, especially in terms of the use of electronic network resources for communication purposes. The main aim is to discuss previous studies of this topic to provide insights into the disciplines within the Social Sciences in an academic environment. Because this community of scholars has been less extensively studied in this context, studies of scholarly communities in the Sciences and Humanities are included in the analysis for comparison. It is worth noticing that throughout this chapter the use of the words 'science' and 'scientific' relates to the division of knowledge that comprises the natural sciences only, as strictly used in the British literature. In Brazil, for example, these terms are more generically used to embrace any field. Therefore, the term 'scholar' is the general one to be used here, referring to any division of knowledge.

3.2 Scholarly communities

The impact of using information technologies on the interactions that occur in the scholarly communication process amongst scholarly communities constitutes the main focus of discussion in this present study. This involves a variety of definitions used in the information science literature regarding communities of researchers working in an academic environment, with the main aim of knowledge production. It seems, therefore, appropriate to discuss 'community' as a concept, alongside some of its major characteristics, as well as the use of the construct in the world of research, as found in the literature.

3.2.1 The concept of community

Community as a concept has been difficult to define. It has been a matter of concern for different groups of theoreticians over the last two centuries. A brief analysis of the literature shows interesting discussions of the concept amongst scholars from sociology and ecology. In sociology, which is one of the major fields within which communities have been studied, there has been disagreement regarding the term. Although the various aspects of this disagreement and the resultant debate are not

important here, it is interesting to illustrate how this issue appears in the sociological literature, where it has been asserted that

> **"The concept of community has been the concern of sociologists for more than two hundred years, yet a satisfactory definition of it in sociological terms appears as remote as ever."**(1)

In fact, it has been observed that "it is impossible to give *the* sociological definition of the community."(2)

Likewise, ecological theoreticians have revealed the same concern when stating that

> **"It is one and a quarter centuries since Saint Hilaire wrote of 'the study of the relations of the organism within the family and society in the aggregate and in the community', yet modern ecologists still equivocate in their use of the word community."**(3)

Nonetheless, the term community has been widely used in a number of contexts in different disciplines, in spite of such concerns relating to the concept. Etymologically speaking, at least, the essence of the word is the idea of 'having something in common'. It is certainly the notion that underlies most of the uses of the term. Whatever the definition, some elements can be identified as comprising the concept. The most common elements identified in a study of definitions of community in sociology were threefold -area (or space), social interactions, and common ties or bonds.(4) Common ties or bonds are an obvious element, as noted above. Interactions seem to be a pervasive element, though in different contexts. Area represents the limits within which a community exists. The ‘community’, as a construct, implies the existence of boundaries, since there is something that determines its beginning and end. Societal changes have had an impact on all these three elements, with electronic communication set to become a major factor.

The study of human communities has been carried out mainly by scholars from the social sciences, more especially the anthropology and sociology fields, alongside the contribution of human ecologists. It has been traditionally linked to the notion of geographical boundaries. In fact, most of the studies in sociology focus on its

structural aspects. Such a focus has been mostly influenced by the paradigm of the Chicago School, i.e. structural determinism, which actually constituted an ecological approach to the study of human communities.

Nevertheless, new paradigms emerged in the social sciences. On the one hand, these paradigms, brought about by the accomplishments of industrial and technological development, "diminished the usefulness of proximity in delimiting the boundaries of communities in the twentieth century."(5) On the other hand, these new paradigms have produced changes in the way the concept of community has been applied.

This change has occurred in anthropology, too. Accordingly, the concept of community has been considered as implying the definition of 'symbolic' boundaries set up by people in interaction: communities are seen as involving a boundary-expressing symbol that is held in common by its members. Contemporary anthropologists, therefore, have studied the community as a phenomenon of culture, "meaningfully constructed by people through their symbolic prowess and resources."(6) It is defined via a symbolic repertoire* that constitutes its boundaries. In this sense, it has been pointed out that, because communities interact with other communities, "the less concrete or physical the boundaries between communities of individuals, the more important will be the symbolic activities a group uses to assert and maintain the boundaries of their communities."(7)

So far as the view of community boundaries as independent of physical proximity is concerned, scholars from different backgrounds have applied the construct ‘community’ to the study of different groups within a variety of contexts. The main focus has been on the interactions among their constituents. Scholars constitute one of these interactive groups. There appears to be no doubt that scholars, especially those playing their roles as researchers in any field of knowledge, need to communicate their results through a communication system. In the context of the sciences, the scientific communication process has been studied as a system of social interactions

* Cohen defines the symbolic repertoire of a community as one that:
- aggregates the individualities and other differences found within the community and provides the means for their expression, interpretation and containment;
- transforms the reality of differences into appearance of similarity;
- constitutes and gives reality to a community’s boundaries.

among scientists: science "is a social system of which interactive communication is the salient feature."[8]

Therefore, the dynamics of the scholarly communication process as a complex system of interdependence constitute a good arena for the study of communities. Among those whose major interests have been communities of scholars, either as producers of knowledge or as its users, are the information scientists. This issue is frequently discussed in the context of the academic environment as the main focus used to study scholarly communities.

3.2.2 The study of scholarly communities

Scholarly communities have been looked at in a variety of ways, which in turn has led to the use of a diversified terminology in the literature. Indeed, the scholarly communication process involves an integral and complex interaction of the scholar, information specialists, technology providers, publishers, and so on. Consequently, communities in this context comprise a wide range of individuals and groups. However, one can narrow the focus onto those who both produce and use scholarly information only -the scholars. Accordingly, interactions between scholars and their peers, as well as the information resources used both to gather and disseminate information, can be taken into consideration as the constituents of a scholarly community.

Diversified approaches have been adopted in the study of scholars, depending on the focus or the context involved. As a result, different terms appear in the literature, such as 'scientific communities', 'research communities', 'academic communities', 'disciplinary communities', and even 'knowledge communities'. There is also the 'academic research community'. As far as computer-mediated communication is concerned, the term ‘virtual communities’ has also been used to refer to communities whose members interact within the virtual environment of electronic network communication. Different terms and definitions can obviously refer to somewhat different communities. Nonetheless, all the approaches refer to the study of specific

clusters of peers within the knowledge world. The discussion here is meant to be fairly general. The term 'scholarly community' is used to encompass all the others.

The study of scholarly communities comprises a wide range of aspects, such as:

- The theoretical foundation used, mainly from the sociology;
- The context within which scholars interact, most commonly the academic environment;
- The information channels used by scholars to interact (basically informal and formal);
- Different criteria to define community boundaries.

The sociological approach, as usually applied to the study of scholarly communities, draws attention to one of the common assumptions -the role played by social interactions in knowledge development. Accordingly, it is observed that "the growth of scientific knowledge is a kind of diffusion process in which ideas are transmitted from person to person, alongside a social interactive process which underlies knowledge development."[9] Alternatively, it has been asserted that the epistemological status of scientific discourse shapes the sociological structure of a scientific community. As a result, scientific beliefs, methods and theories affect both scientific behaviour and social organisation.[10]

Other examples of such a discussion can also be identified. According to what is called a 'new view of scientific knowledge' brought about by the 'new sociological studies of science', cognitive and social are irretrievably linked.[11] In fact, research work involves communication, which, as a communal activity, leads to the identification of the social aspects of science. It has therefore been stated that scientific research is bound up with social interactions, since there are strong social organisations underlying scientific work.[12,13]

All the assumptions described so far are concerned with interactions, which constitute one of the common elements of community, as stated before. However, the 'area', or 'space' dimension is another common element of communities. Since the geographic

basis of community boundaries has eroded, the 'symbolic boundaries' approach discussed earlier is applied to consider this dimension. As such, there are shared symbols systems used by community members to demarcate its existence.

A number of symbols can be identified as characterising the boundaries of a scholarly community. One of these symbols is a paradigm.* The members of a scholarly community share "a conceptual framework involving both theory and practice, which provides researchers with guidance on what problems deserve investigation and how they should be tackled".(14)

The most common symbol shared by a scholarly community is subject matter.(15, 16,17,18) In this regard, the community consists of the practitioners of a specialism. As such, it can be identified at numerous levels. Some of the categories, from the broader to the narrower, include:

- A division of knowledge: social scientists, scientists, humanists;
- A professional group: chemists, biologists, librarians;
- Similar techniques used: organic chemists, high-energy physicists, econometricians;

Other examples can be added, as proposed by Kuhn. Nevertheless, focusing on a common problem, collectively dominating a chosen field, or carrying out research on a particular specialised topic are ways of viewing the specialism as a symbol shared within scholarly communities, often involving a relatively small number of people.

3.2.3 Virtual communities

Generally speaking, virtual communities are "social aggregations that emerge from the Net† when enough people carry on public discussions long enough, with sufficient human feelings, to form webs of personal relationships in cyberspace."(19) Virtual

* Kuhn has reviewed his notion of a paradigm as a symbol shared by community members. Instead, he has proposed the notion of a 'disciplinary matrix', consisting of four basic elements, of which what he calls 'exemplars' relates closely to his earlier notion of paradigm as a community symbol. See Kuhn's second, enlarged edition in 1970.

† Interconnected computer networks that use computer-mediated communication technology to link people around the world into public discussions.(19)

communities have also been defined in terms of "digital villages brought about by the real-time interactive and participatory capabilities of cyberspace."[20] It is worth noting that scholars have been considered the earliest homesteaders on the World Wide Web. Just as in any other community, the notions of social interaction and space are clearly embedded in the view of virtual communities. This fact has given rise to changes in the way both interactions and space have been studied in the context of communities. In the context of 'technologically generated communities'* interactions and space are briefly discussed below, in order to illustrate this issue.

Traditionally, sociologists tend to distinguish two basic types of interaction: direct (demands physical co-presence) and mediated (impersonal).[21] The impersonal nature of the mediated interactions has been challenged, though, by recent experiences with computer-mediated communication (CMC)†, bringing about new dimensions of social interactions as they occur in the present technological environment.

A model for distinguishing types of communities finds its focus in the community's space dimension, namely the geographical and virtual spaces.[23] It aims to provide a framework by which it is possible to both differentiate and analyse various types of computer-related communities. Despite some limitations, which are actually inherent to any model, six ideal types of communities are defined according to the criteria of sharing, or not, both geographic space and virtual space. These are community networks versus ongoing communities, virtual extensions versus intermittent communities and virtual communities versus dispersed communities. They seem useful for the study of scholarly communities in both print-related and electronic environments.

3.3 The scholarly communication process

In the scientific context, it was the work of Garvey and Griffith that provided some of the earliest contributions to the study of the communication process among scientists.[24] Although the authors examined the process within the context of a specific discipline, their model has been the foundation for a large number of

* A special section in Sociological Inquiry, vol 67, n. 1, 1997.
† Thomsen et al provide some empirical examples.[22]

researches on the scholarly communication process (SCP hereafter). Garvey and Griffith's model is concerned with the dissemination aspect of the process only. Consequently, it depicts the information channels used to make research information public, including both the informal and the formal channels. As a dissemination system, the SCP is depicted according to its time dimension (Figure 3.1).

Although the graphic version of the model does not emphasise either oral communication or first draft distribution, which usually occur at the very beginning of the research work, its textual form describes these informal aspects. It is interesting to focus on the channel element of Garvey and Griffith's model, since channels are the vital element to allow interaction between information senders and receptors. The two basic aspects of information channels, namely informal and formal, show a number of different aspects. More especially, these relate to the transience and the broad/narrow casting characteristics of the communication. Accordingly, an informal communication is defined as ephemeral and made available to a restricted audience. In contrast, a formal communication is typically available over long periods of time to an extended audience.[25]

Another point that concerns theorists is that one of the most difficult aspects in the discussion of informal versus formal channels relates to the blurred boundaries between them, which makes any typology difficult to define. As intrinsic components of the process, informal and formal channels coexist, whatever the media employed. As the media change, however, there is an impact on the channels. The advent of electronic communication technologies brought about changes to the three aspects previously discussed. Firstly, there are important changes in the typology of the channels. Secondly, the time dimension of the process changes considerably. Finally, the transience and the broad/narrow casting of the communication itself change, as well. These issues, and a number of others, provide an interesting arena for research in information science.

The functions of the process, namely production, distribution, acquisition and use, may remain the same in such an electronic environment. However, changes related to the individuals and institutions involved, as well as their interactions, are to be

considered in any model that aims to depict the SCP nowadays. A modernised version of the Garvey and Griffith's model based on an electronic environment aims to cast a light on this discussion. In this regard, it is observed that

> **"Computer-based communication was not foreseen by the Garvey and Griffith's model, but any observer of contemporary research communities could not fail to see how scientists have assimilated information technologies into their daily routines."[26]**

Such assimilation, both into informal communication between individuals and formal publication, is the concern of this model (Figure 3.2).

As can be observed, the graphic presentation of the model depicts the SCP as entirely electronic based. Nonetheless, it is pointed out in its textual description that such an electronic-based model co-exists with the paper-based communication system. The discussion of the SCP according to this model emphasises the role that e-mail and listserves have played in information communication among scientists, bringing together individuals separated by long distances and supporting the existence of electronic invisible colleges. A number of changes in the publication process are highlighted: these comprise four main aspects. The first is the composition of manuscripts using word processors. The second refers to submission of articles either online as an attachment, or by mailing a disk. The third is related to the submission of comments from reviewers electronically. Finally, the shortening in the characteristic time delays of the paper-based process is potentially an important change.

A shift in the focus from the channel to the individuals and institutions involved in the SCP allows the topic to be discussed in terms of its components and functions. Different models to be found in the literature illustrate the process. Two of these models are included here since they cover most of the components that comprise the SCP and the functions that are performed. Moreover, both models are concerned with new information technologies as either being part of, or having an influence on the SCP.

The first was proposed by Hills in his contribution to the *Annual Review of Information Science and Technology* in 1983. It states that the SCP consists of an integral and complex interaction of six components, namely the scholar, learned societies, the publisher, the product, the librarian and the new communication technologies.[27] Such a model is basically a description of the main parts of the process, which helps visualise the components directly involved by analysing their

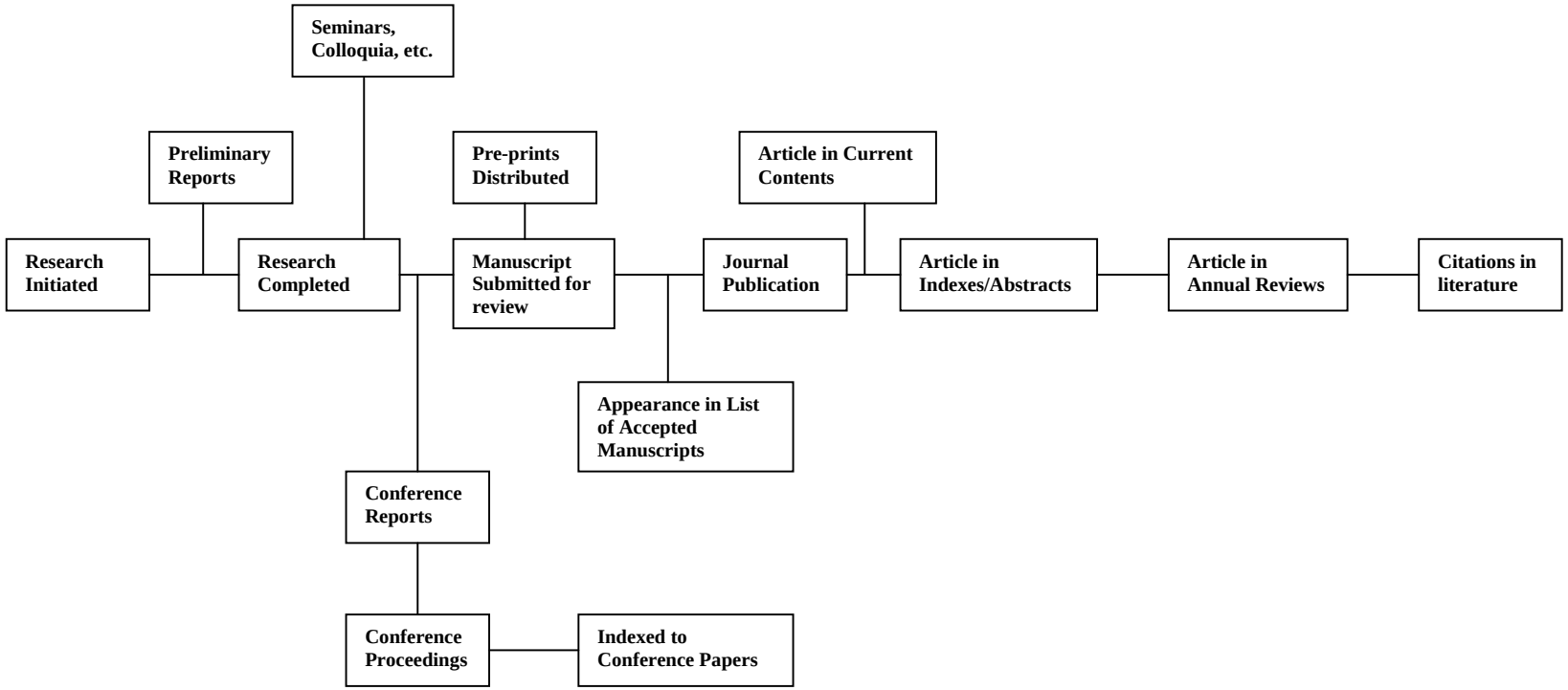

Figure 3.1 Garvey and Griffith's model of the scientific communication system, as adapted by Julie M. Hurd[26]

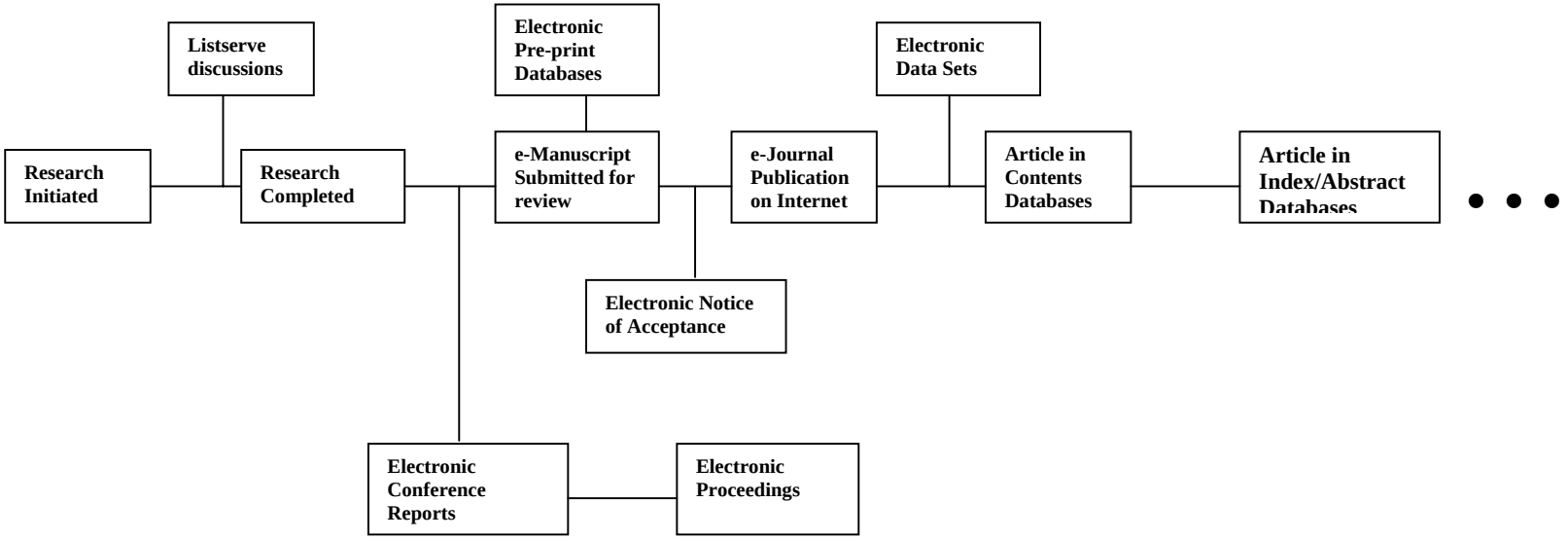

Figure 3.2 Modernised Garvey and Griffith's model of scientific communication, according to Julie M. Hurd[26]

roles. It does not take into account environmental issues that appear to be significant for an exploratory analysis of external factors that may affect the process. In reality, the SCP is mostly concerned with research. Research, in its turn, demands funding that is usually provided by both the government (public sector) and industry (private sector, mainly). These external bodies actually play a role in the process. It is interesting, therefore, to add other components to the model, such as funding agencies and other governmental institutions whose policies relate to research work, in general, and research communication, in particular.

The second model was proposed by Owen and Halm and also concentrates on the structural aspects of the process, describing the functions performed within it.(28) It states that the process comprises four main functions, namely, information production, distribution, acquisition and use. Information production and use comprise the primary functions and are linked to each other by the intermediary functions, namely distribution and acquisition. Because the model aims to answer not only 'what' is done', but also 'by whom', it provides the organisational links involved as well. These links encompass two main components: the organisations (publishers, booksellers, libraries, etc.) and the individuals (authors and end-users). Technological development is considered as having an impact on the transfer of information depicted in this model. One concern of this discussion is that the major impact of information technology on the scientific communication process is related to structural change in both the information sector and the working environment of authors and end-users, which thus creates a new infrastructure for scientific communication. The discussion stresses that

> **"we expect changes in the working environment of producers and users of information to have a larger impact on (or offer more opportunities for) change in the information sector and vice-versa."**(29)

According to Owen and Halm, these changes are occurring in three ways. Firstly, by the emergence of direct links between producers and users of information alongside the exclusion of the intermediaries. Secondly, by the loss one or more components of its, or theirs, independent functions. Finally, by changes in relations between parties, leading to reorganisation. The model aims to contribute to the discussion of the

impact of information technologies on the communication process, which has been on the agenda throughout the 1990s.

In information science, studies of the SCP have been carried out for some decades, based upon a variety of models and following up the changes in information technologies. Since the first attempts in this field, different communities of scholars have provided the focus for an increasing number of studies. As there are differences between subjects, some studies have focused on different disciplines in order to provide insights into these differences.

3.3.1 Differences between the divisions of knowledge

That there are differences between subjects there is no doubt, and the recognition of that has led to the classification of disciplines into different divisions of knowledge. These classifications vary both historically and geographically, i.e. classifications change with time and with location. Changes with time are mainly related to either the emergence of new disciplines as a result of specialisation within a broader area, or the union of two branches of research to form a new specialism.(30) In relation to location, differences relate to different ways of classifying subjects from one country, or region, to another. The division widely accepted in Britain is sciences, social sciences and humanities at the highest level. Although at this macro level the differences may not be significant, as the classification drops into lower levels, the location of a discipline across the divisions can differ between countries. For example, sociology in the UK, according to NISS and SOSIG classifications, is located within the social sciences division, whereas in Brazil, according to CAPES classification, it is within the human sciences division. It is worth noting that 'human sciences' in Brazil has a different connotation from the UK, where it is the 'humanities'. However, the concern of this review is the issues relating to differences in communication patterns at the subject level.

A number of studies have pointed out the differences in communication patterns between different subjects. The first important contribution to this debate came from a comprehensive study carried out in the UK between 1967 and 1971. The results of the

Investigation into Information Requirements of the Social Sciences (INFROSS) gave rise to a discussion of the differences that might exist between social scientists and scientists. Some studies carried out in order to follow up this study, and provide insights to comparisons, are discussed below alongside a number of other studies.

Following up the results of the INFROSS together with other investigations of scientists, one comparative research project studied the patterns of the information-seeking behaviour of scientists and social scientists in order to draw up a generalised profile.(31) The results of this study covered mainly broad trends. It highlighted the fact that lack of standardisation of methods makes reliable comparisons difficult. Nevertheless, the comparisons in this study between the scientists and social scientists showed very similar results in all the aspects studied. Thus one of them relates to the information sources used, with both groups using monographs and journals. However, while social scientists use them to a similar extent, scientists use more journals than monographs.

Despite a number of problems relating to methodology, analysis and the reporting, a more recent study carried out in 1994-1995 in two Israeli universities via a questionnaire survey still found a similar pattern of use.(32) For example, although researchers in the three divisions of knowledge are using journals and monographs a great deal, the greatest use of monographs is made in humanities and the least use is in the sciences.

Differences and similarities in the three main divisions of knowledge also appear in another study carried out at an American university. The aim was to test some of the findings of the INFROSS study. Patterns of information-seeking behaviour by academic researchers in the context of on-line searching were studied via a case study that looked at search request forms collected from 1979 to 1984 (complemented by other observations).(33) The main aim was to explore similarities and differences between scholars from different academic disciplines in their methods of retrieving information. The results are reported as having 'largely supported' previous assertions from INFROSS. One of the main conclusions of the study was that

> **"User characteristics and behaviour have an important effect on user-searcher interaction, which in turn influences the search process .... In this era of user-interface technology, it has been recognised that psychological profiles of the users will become more important than ever."**(34)

As a case study, the results were difficult to generalise. (The investigation was limited to a specific university that may have characteristics that do not apply to others). Nonetheless, the observation concerning individual characteristics appears to be an important aspect to follow up.

One of the earlier comparative analyses of the physical and social sciences looked for differences between the two divisions in terms of information dissemination.(35) The focus was on three major factors: the lag in the processing of information flow, the organisation of information networks, and the transfer of information from the informal to the formal domain. According to the results, the elements and structure of the communication systems in the two groups are similar. However, in the social sciences there are important differences especially related to the operation and use of the communication system, as well as to the patterns of information flow. The differences identified, probably as a result of the 'soft' nature of the subject matter, led to the conclusion that

> **"the overall information flow patterns in the physical and in the social sciences differ ... social scientists appear to communicate more randomly than do physical scientists, whose communication system is more highly developed."**(36)

The study reports only 'gross similarities' of the scientific communication process for most disciplines. It also highlights that such similarities can mask important differences between them.

Almost three decades after the Garvey, Lin and Nelson study commented on in the paragraph above, another investigation of physicists and social scientists was carried out. The aim was to look for differences and similarities in the context of their information-seeking behaviour.(37) According to this comparative study, there are no

major differences between physicists and social scientists in terms of information-seeking patterns. Some differences were identified between chemists and social scientists in terms of performing specific steps in the information seeking process. The study identified a 'remarkable degree of homogeneity' both in activities reported by the researchers studied and in their perceptions of the activities. The authors emphasise some similarities between their conclusions and the broad conclusions from Garvey, Lin and Nelson's findings.

In the context of electronic communication, the use of electronic journals by academics from the three divisions of knowledge has also been investigated in order to identify differences between disciplines.[38] A careful analysis was undertaken and allowed a description of the main characteristics of the fourteen disciplines studied. The results suggest that there are many differences in requirements for electronic journals between disciplines and also many differences in their states of readiness to exploit the potential of electronic services. It is suggested that electronic journal developments should be user-centred in order to understand the requirements of users in different communities. In this sense, the study classified the disciplines into eight different communities and grouped them into two main types: high potential communities (good position to adopt electronic journals) and low potential communities (immature in their use of electronic services). Amongst the former were chemists, archaeologists, information scientists, astronomers, etc. The latter included sports sciences, communication and cultural studies, law and history.

Some recent studies in the context of computer-mediated communication have pointed out differences between disciplines. A study of academics in Australia, the USA and the UK in the fields of biology, medicine, physics, engineering, social sciences, law and the arts suggested such differences.[39] Data regarding the use of computer networks showed significant variations with subject field. There were most computer users in the biological sciences and medicine, followed by physical sciences and engineering, then social sciences, law and business, and, finally, the arts.

Another study focused on the use and perceived impact of the Internet for study and work-related purposes among students and academics from the three divisions of

knowledge.[40] In terms of the use of e-mail as an informal communication channel and e-journals as formal communication, there were no significant differences between disciplines. However, in relation to the use of the Internet, humanists showed less experience than social scientists and these were lower than scientists. On the other hand, there were more humanists using a Campus Wide Information System (CWIS), Telnet and OPAC than social scientists, and more social scientists than scientists.

A third study looked at the use of computer-mediated communication amongst selected academics from chemistry, philosophy, political sciences and sociology in the USA.[41] The results showed that the use of computers among humanists (philosophy) is lower than amongst social scientists (political science, sociology), who in turn use them less than scientists (chemistry). These differences relate both to numbers using and to frequency of use.

One last study worth mentioning here focused on staff members at the Hebrew University of Jerusalem.[42] The study included academics from humanities, social sciences and sciences and looked at five factors affecting the use of information technologies. The factors were the field and research interests, formal training in the use of electronic facilities, self-instruction by means of manuals, general use and knowledge of computers, and perceived need for the information the Internet can provide. The results showed that all the computer-related factors are substantially less fulfilled in the humanities and social sciences than in science and agriculture. The authors emphasise that because the level of computer networking can influence these differences, this warrants further research.

There are thus some significant differences in comparative studies between scientists, social scientists and humanists. Some empirical results, as described above, show differences mainly between scientists and social scientists. It is interesting to draw attention to the differing use through the continuum that ranges from the sciences to humanities. It appears to be true, as has been asserted, that

> **"it is well known that the social and human sciences tend to have different communication patterns from the natural, physical and mathematical sciences".**[43]

In the history of scholarly communication studies, however, apart from comparative studies, there has always been an emphasis on the study of communities of scientists and engineers, rather than on social scientists and humanities scholars. The concern in the present study is to discuss some issues related to computer-mediated communication amongst social scientists, taking into account that this scholarly community has its own characteristics, which have not yet been fully explored.

3.3.2 The study of social scientists

The social sciences encompasses a wide range of subjects leading to an even wider range of methods, approaches and communication patterns, many of them borrowed from both the sciences and the humanities. Books and journals, as formal information channels, are used to the same extent, though journals are less used than in sciences and books are less used than in humanities. Informal communication channels also play an important role, though not as much as in the sciences, but certainly more than in the humanities. However, the variety of branches in each discipline can affect this. For example, the economic historian may behave more like a humanist and an econometrician more like a mathematician. Social scientists have increasingly adopted information technologies in their daily work: again, not as fast as scientists have done, but apparently faster than humanists.

As stated before, a major research project carried out in the UK was the first important study of the different information environments of professionals in the fields of anthropology, economics, education, geography, politics, psychology, sociology and history. Although it was an exploration of almost unknown territory,(44) INFROSS remains the main contribution to the study of the social sciences in the information science field, not only because it is a pioneer survey, but also in terms of its scale, and its influence on other studies. A number of general conclusions are reached: for example, that social scientists depend on informal channels of communication, such as consulting colleagues, for much of their information, and do not use library files and librarians a great deal. Subsequent small-scale studies of social scientists in the UK were undertaken after the INFROSS survey, mainly in the 1970s.(45)

Almost a decade after INFROSS in the UK, a national survey was carried out in the USA as part of a large-scale study of the humanities and social sciences.[46] The sample covered seven disciplines: anthropology, classics, English, history, philosophy, romance languages, and sociology. The main concern was the financial aspects of the scholarly communication system, and the authors reported that scholars are not as concerned about financial issues as librarians, publishers and editors are. One interesting emphasis in the enquiry was that the various constituencies involved in scholarly communication, namely scholars, publishers, librarians and learned societies, are all components of a single system and fundamentally dependent upon each other. The system, in its turn, is highly sensitive to influence from external factors, especially funding agencies and the development of new information technologies.[47]

Humanist scholars and social scientists were also the focus of another nation-wide study in the USA, a decade later.[48] The sample for this study included scholars from literature, classics, philosophy, history, linguistics, political science, and sociology. A different concern is identified in this later study, particularly related to computer usage by academics and non-academics. Three points are highlighted. Firstly, a rapid increase in computer ownership, from two percent in 1980, to 45 percent in 1985. Besides that, more than 90 percent of the respondents had access to a computer at the work place and/or at home. The study did not identify major differences between the disciplines studied, though such differences emerged when respondents were grouped by the division of knowledge, i.e. humanities and social sciences. Secondly, informal communication, in terms of pre-print distribution of colleagues' articles, appeared as important as journal articles for more than 20 percent of the respondents. Finally, an overwhelming positive view of the long-term effects of computers on research is reported.

Another study carried out in the USA in the second half of the 1980s looked at information needs of social scientists.[49] The study revealed a 'striking' overlap in the information needs of social scientists from the five disciplines investigated -namely, anthropology, economics, political science, psychology and sociology. It is observed that social scientists are interested in government documents, journals, books, and newspapers. They seek faster and easier access to information on current research,

and in this regard, conference papers, working papers, unpublished articles and technical papers are basic to many scholars. Databases were also found important for increasing numbers of social scientists.

Monographic publication has had an important significance in the communication patterns of social scientists. To assess the use of monographs by these scholars, as contrasted with journal articles, one bibliometric study examined the diffusion of ideas across time in some selected disciplines - namely, economics, sociology and philosophy.[50] Among other conclusions, the results confirmed the significance of monographs to scholarly communication within the disciplines studied, showing a greater impact than journal articles in terms of citations to them. However, the results also showed significant differences between the disciplines in terms of citation patterns. A marked difference was found for philosophy, as compared with sociology and economics. Data collected in this study showed a decreasing tendency to use monographs, from philosophy, through sociology to economics.

In order to throw light on criticisms of commercial citation indexes regarding their failure to cover citations found in monographs, a bibliometric study of monographic and journal citations was undertaken within the literature of sociology.[51] The aim was to compare authors' rankings between 1985 and 1993, based on monographs and journal citations obtained from a random sample of monographs located via the Social Science Citation Index. The patterns identified were characteristic of informetric distributions (high citation to few authors and vice-versa). The results showed that the relative rankings of the authors do not differ significantly between monographs and journal articles, though there is only a small overlap between them. This led to the conclusion that there may be two populations of influential authors: one in monographs and the other one in journals, as indicated by the limited overlap.

Social scientists have been studied in terms of patterns of information-seeking activities, in order to derive a behavioural model of those patterns, and provide insights for information retrieval system design.[52,53] The disciplines included in this study comprised psychology, education, economics, economic and social history, geography, politics, sociology, pre-history and archaeology. Using the grounded

theory approach, six characteristics have been adduced from the interviewees' responses and provided the framework for the behavioural model. They are starting, chaining, browsing, differentiating, monitoring and extracting. These categories represent the generic characteristics of the social scientist's individual information-seeking pattern. As applied research, this study drew upon these characteristics to build up the proposed model and provided recommendations for system design. The study highlighted informal contacts as a prominent characteristic in the information-seeking patterns of social scientists.

It has been pointed out that the study of information needs has long been acknowledged as an important factor in the design of information services and resources.(54) With this premise in mind, and aiming to testing a new observational technique for identifying information needs, a small-scale experiment has been carried out amongst three academics from the psychology department at the University of Strathclyde, Scotland. The academics were observed throughout the day for three days each and their information needs recorded on a series of observation sheets. Supplementary questions were asked afterwards. Amongst other conclusions, it was pointed out that journals are among the main sources of information and references. There was a preference for print-based methods of information seeking, perhaps because of lack of awareness or inability to manipulate electronic sources.

A small-scale and questionnaire-based survey of social scientists at the University of Wisconsin-Madison in the USA was carried out in 1987 and studied the use of information sources by social science researchers.(55) The aim was to look at differences in the information needs of researchers as related to varying levels of academic status. The study included a random sample of academic staff members and students from the departments of industrial relations, anthropology, sociology and economics. It looked at the use of citations, abstracts and indexes, journals, consultations and conferences, book reviews, and library staff, tools and services. Results showed that journals, alongside tracking citations, are the most important sources of information in the research process. A computerised literature search was ranked as one of the least important sources of information. Private collections were rated as more important than any source related to the library.

As can be inferred from the descriptions above, studies of social scientists have been quite varied. Firstly, the topics investigated are spread over a wide range, though some concentration on information-seeking behaviour appears to exist. Secondly, and as a consequence of the previous conclusion, the research methods vary, though surveys and citation analysis seem to be pervasive. Thirdly, the contexts vary as the studies naturally seek to follow changing trends in the communication process itself. Fourthly, the scale of the research projects differs and, therefore, does not allow reasonable comparisons. Finally, the environments studied are diverse, because the researchers' interests and backgrounds vary, too. In addition, there seems not to have been a systematic series of studies being undertaken over time. Such a scenario makes it more difficult to build up a well-established body of knowledge, which could in turn lead to reliable generalisations. Nonetheless, despite some disparities, some agreement about what constitutes social sciences communication can be observed.

3.4 Computer-mediated communication

Computer-mediated communication (henceforth CMC) has been defined as "any use of computers to transmit, receive, store, and organise information passed from one individual or group to another."[(56)] Burgeoning computer-mediated communication in the academic research environment has led to an increasing number of research projects focusing on the use of computers and other electronic resources. One particular focus is the impact of information technologies on both the research itself, and its communication. Three types of activity have been proposed for the discussion of this impact on research, as depicted in Figure 3.3 below.

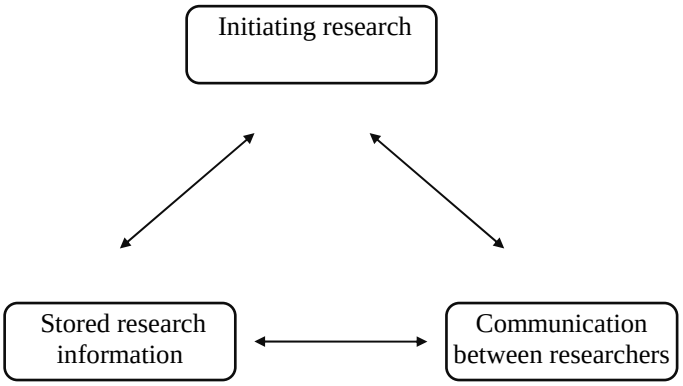

Fig. 3.3

Tripartite structure of the impact of information technology on research activities[57]

It is observed that the boundaries between the three boxes in the diagram are blurred, since all these research activities are continually interacting. Nevertheless, it is interesting to draw attention to the box that is concerned with communication between researchers: not least because it is the focus of the present study, but also because of the importance that this theme has been allotted over the last few years. Moreover, "everyone involved in IT and research obviously expects IT to have a growing impact on research activities into the twenty-first century".[58] It has been asserted that the great growth in information technology during the 1980s was in informal communication rather than in formal channels. For the 1990s it is pointed out that an increasingly flexible use of technology for all forms of messaging is likely to occur. As an example, authors have been increasingly writing research papers jointly over electronic networks.[59] Indeed, the increasing use of electronic networks for communication purposes is on the agenda of many fields as the 21st century approaches. The interest here is to see how this issue has been examined in information science, and to identify relevant topics discussed in the literature. Because of radical and rapid changes that have occurred in both the availability of information technology and the number of users who have access to networked computers, it is not always possible to make comparisons between previous and current studies in this context.[59] Nevertheless, it may be worthwhile to observe possible trends appearing throughout the 1990s.

3.4.1 The impact of information technology

Bell[61] has published a literature review about the impact of electronic information on the academic research community including findings for the period between 1993 and 1997. It shows that such impact has been significant, though limited. The review emphasises two specific issues where there is consistent evidence. Firstly, the preference by academic researchers for familiar and well-established sources of

information in their own collections or libraries. Secondly, the wide use of e-mail, discussion lists and Web pages in informal communication, with consequent changes in the invisible college. Bell's review identified a significant non-use of electronic information and points out to an imperative need to extend access to equipment, resources and support throughout academic institutions.

Looking at how electronic communication can either complement or substitute print communication has been an important aspect of assessing the impact of information technology on the SCP since the beginning of the 1990s.(62) It has been done primarily via the study of the use of information technology in information-seeking and communication activities by researchers in the sciences and social sciences. It has been observed that such impact has been relatively minor:

> **"in relation to the communication of research, the employment of electronic communication as a complement to or substitute for the traditional forms is, as far as can be discerned, virtually non-existent".**(63)

Nonetheless, the impact of information technology on information activity is a rapidly changing area of study. The effect of changes in the information environment on the world of academics and their research needs to be investigated on a continuing basis. It should include the study of both informal and formal communication, since there may be different degrees of impact on these two domains.

During the 1980s, the influence of computer-mediated communication on the scholarly communication process has been assessed in a number of small-scale studies. A comprehensive study of the scientific community in the UK was carried out between the end of 1990 and the beginning of 1991.(64) The aim was to investigate significant changes that might be occurring in the scientific information system in the country as a whole. The study covered the academic and the industrial environments, as well as all the main constituents of the process, namely, researchers, publishers, and librarians, via interviews and questionnaires. Some results from the academic environment pointed to important issues to be further investigated. It was found that the impact of computer-mediated communication on academic departments was highly idiosyncratic, depending on field and departmental tradition, as well as the age

and personal inclinations of staff. One of the most significant changes relating to informal communication was the increased use of electronic networks and the consequent use of e-mail which tends to give birth to new information 'cliques'[*]. The study emphasised the use of fax at that time as an important means of exchanging research information informally, with some advantages relative to e-mail.

An examination of the use of networked information in research and inquiry was carried out via a mailed questionnaire survey in autumn 1995 amongst academics from the three divisions of knowledge at eight universities across the USA.(65) The focus was on research and academic work that included both communication activities and information-seeking activities. A number of results are summarised here and provide interesting issues to follow up. Firstly, in terms of networking, the study found a large majority of respondents (91.6 percent) having access to an Internet connection at work. Secondly, regarding the use of electronic journals, it was found that only a small proportion (13.7 percent) of respondents had subscribed to an electronic journal and even fewer (3 percent) had submitted an article. Thirdly, changes in collaborative work were reported by almost half of the respondents (46.9 percent). They considered that their patterns of behaviour regarding collaboration have changed and they have co-authored papers as a result of this kind of networking. Finally, changes in their communities were reported by nearly 60 percent of respondents, who suggested that their disciplinary communities have undergone changes recently as a result of networked information.

3.4.2 The informal communication domain

Informal research communication among scholars provides an important discussion forum. It ranges from the exposure of an initial idea that might be investigated, to comments on the research findings published in formal sources. Thus, it may involve oral, written, print or electronic information. Besides that, it covers everything from 'chit chat' between researchers to pre-print distribution of a journal article, or the presentation, and/or publication, of a conference paper. Indeed, informal communication is an important stage within the entire scholarly communication

[*] Similar to an 'invisible college', but somewhat different in scale and approach.

process, which embraces links between producers and users. Such links comprise the diversity of communication channels through which they communicate. Scholars often use informal channels to communicate with colleagues in a more interactive and dynamic way. According to current discussion in the literature, e-mail has become the most used electronic facility available for scholars to communicate with their colleagues informally.

The extent to which e-mail has been used for scientific communication appears in a survey carried out in the first half of the 1990s among faculty members from two universities in the United States, which included scholars from a wide range of subject fields.(66) A questionnaire sent via e-mail asked questions about the demographic characteristics of the respondents (such as speciality, age and experience with computers), the extent of e-mail and discussion lists usage, and e-mail usage for scientific communication purposes alongside traditional channels. According to the results, there were more people from the hard sciences using e-mail than from the soft sciences, and the former had a longer experience of computers than the latter. The study found a positive relationship between experience with computers and the use of e-mail, and a great variability in the extent of e-mail usage by staff members. Compared with traditional facilities, e-mail appeared to occupy a significant position as a communication channel. The overall conclusion of the study was that e-mail might well become an essential means of scientific communication, though 'much remains to be done before e-mail truly becomes indispensable'.

Some comments on this study need to be made. Firstly, because it included very few variables, significant relationships cannot readily be found. Secondly, it focused on a wide range of specialisms, including all divisions of science. However, the study failed to seek associations related to differences between the major academic divisions themselves. Thirdly, the analysis was impoverished by an entirely quantitative design. Nevertheless, some of the conclusions can contribute to the discussion of the use of e-mail.

Indeed, a number of studies carried out afterwards have shown that informal communication through e-mail has now become an indispensable form of contacting

colleagues and exchanging information.[40,41,42,61,67,68] Respondents of Voorbij's survey identified e-mail as an important and frequently used facility. Cohen pointed out that e-mail was identified as the most popular use of CMC and has been used, besides communicating with colleagues, to participate in committees, share manuscripts, and discuss with journal editors. Lazinger et al reported that 'virtually all Internet users in all groups use e-mail extensively, primarily for correspondence with colleagues about research.' Bell reported a wide use of e-mail, based on the studies she reviewed. Covi and Kling reported that all the informants in their study mentioned e-mail as an increasingly essential mode of communication, although a few preferred not to use it. Those who preferred not to use, however, reported being pressured by peers and administrators to do so. Kaminer and Braunstein's study examined the percentage of academic staff using each of thirteen Internet services. Among the thirteen categories, e-mail appeared as the most used, with a rate of 94 percent.

Institutional policies can have an effect on the use of information technology by scholars. This assertion was assessed in a comparative study of humanities scholars at two universities in the USA, one independent and church-affiliated, and other land-grant and state-supported. The main aim was to look for the effect of the institutional environment on e-mail use by academics.[69] To do so, a questionnaire survey was carried out in the autumn 1995, including both users and non-users, and analysed by institution, gender, age, and e-mail usage. The main conclusion, reported in 1997, was that the respondents were using e-mail to a greater extent than previous studies of similar groups had shown. The major use reported was to communicate with colleagues. In geographical terms, communication world-wide was a relatively low-ranked option, whereas communication within the USA was the highest. The study found differences relating to each institution, with some major differences due to the level of computer networking. These stem from differences in sponsorship and funding due to the sort of affiliation of the institutions. Small differences were found related to gender, but the age factor showed more significant differences. In this regard, it was reported that ‘older faculty who are more established in their careers and have developed over the years more traditional methods of communicating with their professional contemporaries may not view e-mail as a necessary or desirable form of collegial interaction’. Such evidence seems worth following-up in terms of

the individual factors that influence the use of computers for communication purposes.

3.4.3 The use of information resources

Frequency of library use may have an effect on the frequency of computer usage. In order to investigate such an assumption, and also to assess the attitudes of academics towards computing, a comparative study was carried out at Western Michigan University amongst all staff in 1994.[70] A questionnaire survey was used for collecting data, which were analysed according to rank, age, and affiliation (academic college). According to the results, there is a positive relationship between library use and computer use, but this may be open to question. The weakness of the model adopted, which did not take account of other variables that might have an effect on such a relationship, led to a poor research design. Besides that, even the variables studied do not seem to have been fully related to each other.

The tasks performed in order to undertake the research work may also be affected by the use of computers. A survey of academics from different countries and in different fields of knowledge carried out in the second half of 1992 showed that there was a widespread use of information technologies as tools for performing tasks. These tasks include final draft preparation, class marks, other writings, information acquisition and collaborative work. In fact, printed publications were reported as extensively electronically assisted. It was stated that "the generation of manuscripts by academics is today almost universally by word processor, and articles are generally accepted by formal publishers in digital form."[71]

Another study looked at factors as affecting the use of information technologies amongst members of academic staff at the Hebrew University of Jerusalem in 1995. The study included academics from all divisions of knowledge. Among a number of different findings, the results from all groups indicated that ‘the primary influence of Internet use on the professional life of faculty members has been in increasing co-operation with colleagues’.[72]

Three categories of factor were studied as influencing the adoption and use of electronic networks by scientists and engineers in small universities and colleges in the USA between autumn 1993 and spring 1994.[73,74] The study included: systems factors (accessibility, proximity, workstation availability and prior experience); personal and professional factors (academic discipline, task and perceived utility); and institutional factors (not reported). A questionnaire survey was carried out amongst users and non-users, followed up by interviews with a small sample of the academic staff and administrators. Adoption and use were measured for e-mail, discussion groups, remote databases, programs, and file transfer. The study highlights the influence of the level of computer networking on the decision to adopt and use computers, as some other studies also do. Another significant relationship was found between experience with computers and intensity of use. The most used service of all for research, teaching, current awareness, social interaction and administration was e-mail, and the purpose for which all services were most used was research. In geographical terms, most interactions were between colleagues within the USA, and least -much below the others- was communication outside the USA.

Despite the diversity of variables studied, this study does not seem to have established relationships between them, perhaps because the results have not yet been fully reported. One particular example is the respondent profile, described in terms of academic rank, academic disciplines and highest academic degree, but apparently not analysed for usage in terms of these variables.

In another study, a wide range of the staff at four graduate centres of the State University of New York were approached in 1992 to assess the availability and use of information technologies in relation to library services.[75] The study also aimed to elicit users' perceptions of obstacles to use. A questionnaire survey was carried out with both the academic and the administrative personnel. Among other results, the study identified differences between the major disciplinary divisions, especially in terms of level of computer networking, which was found to be considerably lower in the humanities than for scientists and social scientists. These results agree with those from other studies reported in section 3.3.1 above. Training in the use of computer facilities appeared to be an important factor in increasing use.

A nation-wide survey carried out in 1997 in the Netherlands looked at the use and perceived impact of the Internet for study or work-related purposes amongst students and academics from the three divisions of knowledge.(76) The study used questionnaires and interviews and focused on searching information sources on the World Wide Web. Results from the questionnaires showed that, in general terms, the great majority of the respondents had been Internet users for more than one year. In terms of informal channels, electronic mail was identified as an important and frequently used facility, as well as searching on the Web. In terms of formal information channels, the use of electronic journals was identified as rather low. Data gathered from the interviews revealed that the use of the WWW as an information source is less important than might have been expected. It has mainly been used for general, factual, ephemeral, bibliographic or very specific information. The social scientists expressed themselves as disappointed with the quality of Internet resources. None of the informants were inclined to publish research material on the Internet, except as a parallel version of a printed publication. For this population, printed journals are the most important medium for communication.

In a study of the relationship between the use of CMC and productivity among academics from different disciplines, some of the results relate to the general use of computers.(77) Data were collected in autumn 1994 amongst academic staff members of 26 colleges and universities in the USA. Almost all the respondents (95 percent) had access to computers either at home or in their offices, though a smaller number reported network connectivity (71 percent). A positive relationship between access and likelihood of using was identified. The study identified differences in relation to demographic characteristics. Full professors used computers less than assistant professors, younger academics used them more than their older counterparts, and female academics used them more than their male colleagues.

Post-graduate institutions are more involved with research than other higher education institutions. With this premise in mind, the study of the use of digital libraries within the context of research activities was carried out in two PhD-granting institutions in the USA between March and September 1994.(78) A semi-structured interview survey was conducted amongst researchers in molecular biology and literary theory,

computer support providers and librarians. Digital libraries are defined in the study as a collection of electronic resources and services for the delivery of material in a variety of formats. It includes OPACs, bibliographic databases, discussion lists, electronic journals and bulletin boards. Similarities in the pattern of digital library use were identified for all informants. Every staff member was using computers and printers for producing documents. Few were sharing pre-prints via computer networks. All informants mentioned the use of e-mail as an increasingly essential mode of communication, though there were differences between the two groups studied. Molecular biologists were routine users whereas some literary theorists were still resisting using e-mail. Other resources reported were Gopher and the WWW (considered frustrating), CD-ROM databases (especially amongst molecular biologists), OPACs (especially amongst literary theorists). The conclusion of the study was that staff members tended to use digital libraries to supplement, but not to replace traditional modes of communication. They still depended primarily on peer-reviewed referral and published bibliographies, but e-mail was quickly becoming a key medium for routine interpersonal scholarly communication.

Some inferences can be made from the studies described above, which covered a number of disciplines in the context of the use of electronic networks by scholars within an academic environment. Firstly, studies within a single discipline seem to be rare. Secondly, although factors that may affect the use have been studied, the results are scattered, and thus do not make it possible to identify ‘core factors’ that can play an important role in this context. Nevertheless, some demographic characteristics affecting the respondents seem to be common to many studies. They comprise basically experience with computers, age and (or) seniority. Some ‘situational’ factors, such as the discipline, or subject, as well as level of computer networking also appear as commonly studied factors. Thirdly, in terms of methodological aspects the majority of the studies relied upon purely quantitative approaches, and consisted essentially of descriptions aimed at explaining the particular problem investigated. Some fail to establish meaningful associations that could help understand the relationships through richer analytical approaches.

3.4.4 Formal electronic communication: the case of electronic journals

Publication constitutes the ultimate outcome of research. Scholars in any field feel compelled to publish as proof of effective scholarly work. Although some differences exist between disciplines, journals and books comprise the primary media to publish new knowledge formally. In the contexts of the natural and social sciences, the scholarly journal is the most important channel for communicating research, though monographs also play an important role in the social sciences, as compared to the natural sciences. It is in humanities that monographs constitute the major channel for formal knowledge dissemination.

Changes that are occurring in the publishing environment brought about by the use of electronic networks "may be complex and problematic, with experiments that work and others that fail. This is a rare and wonderful time to examine the future of journals, but may not be a large window of opportunity to effect real change."[79] Indeed, the hottest debate in electronic communication relates to journal publishing on the Web. A number of authors have discussed issues concerning electronic journals.[80,81,82,83,84,85] Like any innovation introduced into a well-established environment, the electronic journal has its enthusiasts and its adversaries. The enthusiasts claim that electronic journals will become a substitute for the print version, which, in turn, are expected to disappear. Adversaries do not accept such a replacement of the prestigious printed journal. From the former group comes the claim that

> **"Although printing has for three centuries been an agent of change in scholarly communication, we should remain mindful that central values of scholarly communication ... pre-dated the first learned journals; so, too, can they post-date the paper paradigm. The journal as we have known it was successful because it was the best technology available to do the job. This is no longer the case. Paper-based journals are no longer expedient because there is now a more effective and efficient technology than printing by which to communicate among the extended scholarly community."**[86]

The latter group counterclaims that there is 'an apparent reluctance within the academic community to accept a replacement to paper-based journals'.[87] In this regard, what has been observed is that what will determine the future of a journal is whether the functions it performs are perceived to have continuing value, irrespective of the medium it appears in.[88] Results of a large survey carried out in Australia, the UK and the USA and involving academics from different disciplines pointed to issues like prestige, readership and peer review as important factors for electronic journals.[89]

Parallel publishing: a matter of complement, rather than replacement

The consequence of such a dichotomy is that there is now a trend towards adopting both versions: printed and electronic. Indeed, traditional means of communication continue to be used, and both old and new methods will be used simultaneously.[90] In this sense, it has been stated that

> **"Parallel publishing safeguards publishers' investments, since neither authors nor readers are likely to object to such an arrangement. It should also help towards a smoother transition from paper-based usage to electronic handling"**.[91]

User studies of electronic journals have been concerning researchers at Loughborough University in the UK for some time. Three successive projects (namely, Elvyn, InfoTrain and Cafe Jus) have been carried out to examine the academic user view, though some findings from the industrial environment were also included.[92] Results of Project Elvyn, which studied a number of issues related to the implementation of the electronic journal, *Modelling and Simulation in Materials Science and Engineering*, published by the Institute of Physics Publishing,[93] suggest that some user requirements could not be satisfied at that early stage (i.e. 1995) of electronic journals. One conclusion was that "most publishers currently see all of their journal

titles, new and old, as potential candidates for parallel publishing."[94] It has subsequently (i.e. 1998) been observed that

> **"parallel publishing of an electronic version of a paper journal has enabled publishers to 'test the water' for electronic journals. Since the paper journal already has a level of prestige, a readership and a back run, the electronic version can inherit these."**[95]

A number of studies have pointed to this co-existence of print and electronic publications.[96,97,98,99] Expressed intentions and information provided to potential authors were studied for a sample of both electronic and (well-established) printed journals on Information and Library Studies to look at their common characteristics. One of the major results was that "a majority of the publishers involved in producing the set of printed library and information journals discussed here are examining the scope for parallel publication in print and electronic form."[100]

Parallel publishing is also highlighted by a survey of online journals in science, technology and medicine. The nature and form of the journals together with their future shape and publication processes were studied, amongst other issues. One of the main conclusions is that "the immediate future of online journals is set to be dominated by electronic editions based on established paper journals and retaining the appearance of familiar paper layouts."[101]

The impact of electronic journals on scholarly communication

The impact of electronic journals on the formal scholarly communication process was studied via citations in the literature to the end of 1995. The study was based on a sample of 131 journals from all divisions of science, out of which 77 were classified as scholarly and peer-reviewed. The great majority (69.4 percent) comprised an electronic version only. Out of 4,317 references identified, 83 were to online sources, the majority of them being to URLs.[102] As can be inferred from such a study, although increasingly available, electronic journals do yet not seem to constitute a major information source. In fact, Bell affirms that during the period reviewed in her

work, there has been no appreciable change in attitudes to electronic publishing and some citation studies support the lack of impact.[103]

Differences between disciplines have been identified in terms of the use of electronic journals by scholars from the sciences, social sciences and humanities. It was observed that, because the journal itself plays different roles in each discipline, the implications of such differences for the provision of electronic journals are considerable. In relation to changes that might be detected in scholarly practice due to the existence of electronic journals, one study noted that "there is a little sign of a cultural change associated with electronic journals but more sign of an electronic culture change which is enabling scholars to work in a global village through e-mail and the Internet."[104] It is also reported that "in general the adoption of electronic journals is behind the adoption of other electronic services although there appears to be a close correlation, i.e. the adoption of electronic services in general is a good predictor that electronic journals will be under consideration."[105]

The acceptance of electronic journals by scholars

The acceptance of electronic journals by university staff is still a matter of some uncertainty. In order to investigate the diffusion of electronic journals into business schools in the USA, a survey was undertaken amongst academic researchers from 95 universities and colleges in 1997.[106] The results showed that the number of researchers aware of electronic publishing, reading electronic journals or intending to publishing in electronic journals is very small. It was also observed that those who served on promotion and tenure committees were more likely to have read electronic journals. Such conclusions cast some light on the widespread concern about the recognition of electronic publications for reward and promotion.

Concerns about the respectability of electronic journals and their perceived inferior status compared to printed ones have been identified as a major issue in Bell's review.[107] Some of the studies reviewed showed that there are concerns about the prestige of electronic journals, mainly in relation to the attitudes of funding agencies and assessment bodies. Rewards from universities and grant-giving agencies, as well as recognition by the scholarly community, that can be expected for research

publication, are doubted as regarding electronic channels. In this sense it has been observed that

> **"At present, some universities and grant giving institutions will not accept electronic publications for the author's credit. This situation is likely to change, but, for some time to come, researchers whose career is not fully established may wish to play safe by putting their best work into the best traditional journals."** (108)

Nonetheless, it has already been pointed out by Bell that the published guidance of the Research Assessment Exercise for the UK universities actually states that refereed journal articles published through electronic means should be treated on the same basis as those appearing in printed journals. CAPES in Brazil have not yet considered this sort of support. There is no direct reference to electronic publications in the discussion of new criteria for the post-graduate assessment, which include research publication assessment.(109) Publishing research information is one of the most important criteria in the CAPES assessment of both the post-graduate programmes and the researchers' CVs.

The attitudes of university administrators concerning the recognition of electronic publication are significant for its use by academic scholars. A survey of decision makers (directors of academic libraries and other administrators) from 100 major universities in the USA was undertaken via mailed questionnaires in 1993.(110) The main aim was to assess their attitudes toward networked electronic publishing of research articles. The results suggested that the most important benefits of electronic publishing of research articles are reducing costs and increasing speed of publication, followed by a number of other issues. All the aspects, however, were reported in terms of perceived desirability because in terms of immediate probability of achievement, the most likely to occur was only increased speed in publishing. The questions about priorities for assigning university resources and establishment of a scholarly publishing network received the lowest rating in the survey. That is, although there was a perception that electronic publishing can bring benefits to the university environment, there was not yet a commitment from their administrators to invest in an infrastructure for that. Political decisions by both the government and the institutions of higher education appear to be vital not only for the development of a

technological infrastructure, but also for the resultant use of IT for communication purposes.

Whether the electronic journal is a viable channel for formal scholarly communication must be assessed according to the criteria of acceptability of scholarly communication channels and the reward structures operational for such channels. Three types of data were collected in one study carried out in spring 1994: data regarding a selected sample of electronic journals, data regarding scholarly communities and data regarding citations to electronic journals.(111) Data regarding scholarly communities were gathered through a survey of journal contributors (authors and editorial boards). The results showed that a negative response to electronic publication was "very little in the formal evaluation process associated with academic life", thus electronic publication did not seem to have led to failure to receive rewards. However, the study identified a significant number of respondents who believed that their colleagues and people in key positions perceived their involvement with electronic journals as being less significant than with traditional print publications. The primary barrier identified was people's fears and perceptions about what electronic publication is, and what it can lead to.

Scholars' perceptions of electronic journals have been assessed in 1996 via a study of scientists at British universities to see how, and to what extent, such a scholarly community might adopt electronic journals on a regular basis.(112) Factors that both help and hinder the incorporation of electronic journals into communication processes were analysed. Amongst other findings, the most important characteristics of journals -either print or electronic versions- identified were the quality of the articles and the prestige of the journal. Views regarding print versus electronic journals showed that the former remain far more acceptable. The differences are, indeed, significant. The inclination of scholars in the sciences for publishing in electronic journals turned out to be related to their acceptance by the scholarly research community, by funding agencies and by university reward committees. The overall conclusion is that

> **"The major sticking point for authors was the perceived lack of prestige of electronic journals. Most of those who commented on this saw the way forward as being parallel publication of journals, where the print version**

> **already possessed high prestige. Since this is currently the preferred policy of most publishers, parallel publishing can be expected to dominate in the immediate future".**[113]

Attitudes towards electronic journals were also assessed in a small-scale questionnaire survey of academics from five different faculties in a British university in late 1996 and early 1997.[114] The study found that 28 percent of academics had used electronic journals, with some differences between disciplines. The quality of articles in electronic journals was considered to be the same as for print publications by 71.4 percent of the respondents. In terms of submitting articles to an electronic journal, only six academics, out of seventy-five, had done so. The majority of the respondents (nearly 60 percent) preferred to have hard copy rather than read articles on-screen. The most common reason for non-use of electronic journals was lack of awareness, followed by not feeling comfortable with the technology. Nevertheless, 80 percent of the respondents were prepared to consider using electronic journals in the future. The study asked respondents about perceived advantages of electronic journals. Prestige was the factor least reported as being an advantage of electronic publications, with zero percent of responses. Correspondingly, as regards disadvantages, lack of prestige received 28 percent of responses. One final issue reported relates to the future electronic journals. The authors note that the opinion of a lecturer in the Education faculty sums up the general impression that emerged: "I would not envisage them replacing written material but as an optional/alternative means of making text available."[115]

A last, but not least, issue relating to the acceptability of electronic journals is concerned with their user-friendliness, especially with their readability on the screen. It is obvious that such concerns do not apply only to electronic journals, but to any electronic text, especially electronic monographs, since the attitudes towards it are mainly related to the length of the text.

> **"…Reading off the screen is still vastly inferior to reading off paper. Even I, who have these expensive screens and fancy myself as a pioneer of this Web Lifestyle, when it comes to something over about four or five pages, I print it out and I like to have it to carry**

> **around with me and annotate. And it's quite a hurdle for technology to achieve to match that level of usability".**[116]

Several authors have pointed out this issue, which arises from their research findings. Schauder has observed that a great majority of his respondents prefer to read electronic articles as printouts rather than on the computer screen.[117] Likewise, Woodward et al have found that lengthy on-screen reading, when an article has to be read in depth, remains unpopular. The authors emphasise that "efficient and rapid printing capabilities are vital, and will continue to be so for the foreseeable future."[118]

3.4.5 Electronic books: first steps

The formal communication channels in an electronic environment, viewed in terms of the concerns of social scientists, should not ignore the electronic publishing of books. There is evidently more literature on the electronic journal in terms of electronic publication in the academic environment. However, some pieces of work have started appearing about electronic monographs as well, since changes in the publishing industry are also being felt in this sort of publication.

The discussion about the current situation of the printed book industry in the academic environment involves issues concerning at least three aspects.[119] Firstly, the decline in the purchases of monographs by academic libraries. Secondly, the decline in producing scholarly books by university presses. Finally, in the USA at least, the need by young scholars to publish doctorate dissertations and tenure projects in book form. In this sense it is argued that the traditional book can possibly be supplemented with electronic publications. It has been hypothesised that electronic monographs can be sold to libraries, which will make them available to their readers. Those readers can then search the texts, print them out, bind them in a special machine attached to the printer and take them away for reading as they are used to doing with a printed book. It is speculated then, whether such electronic monographs would receive the same recognition as printed books have done. Considering that rapid changes in the world of learning do not allow predictions for the next decade or so, it has been stated that "it will remain within the Gutenberg galaxy ... the electronic book will act as a supplement to, not a substitute for, Gutenberg's great machine".[120]

Those concerned with these issues have argued that electronic monographs have received insufficient attention, since electronic scholarly publishing has usually been concerned with electronic journal publishing. In order to investigate the current situation of electronic monographs a study of publishers was carried out in the UK between October 1997 and April 1998 via an analysis of the literature and a survey.(121) The results showed that the structure of the electronic monographs publishing trade currently comprises three modes of publishing.

The first involves the university presses. In the UK, the experience of university presses is still modest, as compared to the initiatives in the USA, where the electronic publishing of monographs is predominantly by such presses. The second consists of the non-university commercial publishers. In this case, there have been similar patterns in different countries. Finally, there are small-scale individual publishing initiatives both in the USA and the UK. This sort of publishing is typified by academics publishing monographs directly on the Web.

The study described in the two last paragraphs has highlighted the necessity for a partnership between all constituents in the SCP, namely the scholar, librarians and publishers. It also identified differences in terms of the physical characteristics of electronic monographs as between the UK and the USA. In the UK, CD-ROM monographs were 'remarkably more used' than those available on the Web, whereas in the USA they were used in 'almost the same proportion'. The authors consider that electronic monograph publishing is "undoubtedly a small but growing area of significance in the U.K."(122)

3.4.6 Collaborative work and productivity

Electronic communication, either informal or formal, has had an impact on collaborative work over the Internet. The way academics have been using electronic networks can actually be labelled a 'global collaboratory'* with the electronic document forming a vital part of it. Within this 'collaboratory' environment, some of

* According to Hurd(26) the term 'collaboratory' was coined in a National Research Council report and melds the notion of collaboration with that of laboratory to convey an image of a world-wide network of computers supporting a global research community.

the tasks performed in the communication process are tending to rely increasingly upon electronic facilities.

There is indeed an increase in the number of authors writing research papers jointly over electronic networks.[123] Empirical evidence has been obtained from some surveys. Lubanski, who carried out a survey in the UK and the USA in 1997, reports and quotes some of his respondents, illustrating how this issue has been viewed in terms of increasing co-authorship of papers and co-ordinating research between co-authors.[124] Cohen asserts that, although some previous work found little evidence, his survey of academics in different divisions of knowledge in the USA identified significant differences relating to the incidence of co-authorship among CMC users.[125]

In fact, there appears to be a link between the increase in the opportunities of working collaboratively and an increase in research productivity. Morton and Price's study found that the main effects of computerisation perceived by respondents were on writing efficiency, research productivity and research creativity.[126] More recently, Cohen has found a positive association between the use of the Internet and productivity.[127] This was also the case in a study carried out by Kaminer and Braunstein between 1995 and 1996. [128] The study used three sources of data, namely bio-bibliographies, computer logs and a questionnaire combined with data from the *American Men and Women of Science*. The subjects of the study were academics from the College of Natural Resources in Berkeley, California, who held a PhD. Only processes that used the Internet to retrieve or access information were taken into account. Results showed a massive use of e-mail (94 percent of the respondents), followed by the use of telnet (62 percent) and WWW (44 percent). Electronic journals appeared in the study with nine percent of use. In terms of the effect of the use of the Internet on productivity, the study found that "the use of the Internet adds significant exploratory power to the traditional model of scholarly productivity."[129]

3.4.7 Creativity

As summarised above, the impact of computer-mediated communication on productivity has been assessed in a number of studies. Another issue that seems to deserve investigation is the impact on creativity. Although the use of IT might also have an impact on a researcher's creativity, it appears that little has been done in terms of studying this impact hitherto. Nevertheless, two studies that assess such an impact can contribute here.

The first study was the ACLS survey of scholars, carried out in the USA between 1985 and 1986.[130] The study included scholars from both academic and non-academic environments in different subjects. Amongst several other results relating to the effect of computer use, a modest, but still substantial, number of computer users at colleges and universities reported improvement in their research creativity and the quality of their teaching. Sociologists, who reported much greater reliance on statistical analysis than respondents from the other disciplines investigated, had the highest percent who credited computers with improving their research creativity and the quality of their research.[131]

The second study was carried out through a message posted to the correspondents of the Public-Access Computer Systems Forum (PACS-L) in October 1992.[132] The message involved an informal survey which aimed to find out whether there is a correlation between creativity and connectivity. As the author, himself, highlighted, the message was neither a representative survey, nor a research project intended for later publication; it was only a 'spot-check on attitudes' amongst PACS-L active correspondents. According to the results obtained (nearly 2 percent response rate), 62.5 percent of the respondents (88 in total) considered that being connected made them more creative. This compares with 97 percent of them who considered that being networked made them 'better informed'. It was also reported by 59 percent of the respondents that when doing creative work related to their own field (library science), they normally do it networked. A number of comments from the respondents about how being connected has helped their creativity were included in this survey.

3.5 Concluding remarks

The number of electronic journals and other electronic facilities available for use by scholars in university environments is rapidly and continually increasing and diversifying. Scholars from a number of disciplines have already found themselves involved in the use of electronic journals as both a vehicle for disseminating their output and a source for finding relevant information to build upon. Furthermore, it seems that there have been increasing pressures upon scholars to use electronic facilities for communicating with colleagues informally. However, a range of factors may affect the use of electronic journals, and other electronic communication tools, by scholars within an academic environment, such as a university department.

Firstly, differences related to the discipline can play a role in the communication patterns of scholars. A number of studies discussed in this literature review highlight this matter. Accordingly, it can be stated that technological orientation in scholarly communities ranges from high to low in the same order as a continuum from the hardest to the softest sciences. That is, as a general tendency, it appears that the harder the discipline, the higher the use of technology, but this may be time-dependent. Empirical evidence still needs to be obtained concerning differences in disciplines due to the variety of methods, approaches and paradigms, especially in the social sciences. The availability of computers and related facilities, as well as the level of computer networking (which are related to the subject area) seem to influence their use by scholars, which in turn may lead to differences in their interactions.

Secondly, social interactions within and between scholarly communities, and also between such communities and other individuals and external bodies, underlie the development of knowledge. The diffusion of ideas across communities of scholars and the (expected) growth resulting from such an interactive process can be influenced by the use that scholars make of information technologies.

Thirdly, there are changes that occur with time. Findings from previous decades show a significant difference from findings in the 1990s. Moreover, throughout the 1990s, there have been rapid changes in the availability of information technologies, especially of networked computers, which also lead to differences.

Finally, a number of factors relate to both the environment where such interactions take place and the interacting individuals. Pressures exerted upon scholars by the academic environment are an important influence. The most pervasive ones seem to come from their peers in terms of assessing both quality and quantity of outputs, and the channels used to produce and access them. Therefore, another issue that needs to be taken into account is the links between scholars as producers/authors and users/readers. Such links encompass the different channels and sources through which key partners interact. As stated before, because scholars usually play both roles - though to different extents - any study of the usage of information channels by members of scholarly communities should take account of differences that can occur. Moreover, factors relating to the characteristics of the scholar as an individual have been observed to influence computer usage. The converse is also true, since computer usage can have an effect on the individual and his or her interactions with information technologies for communicating research.

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CHAPTER FOUR

METHODOLOGY

4.1 Introduction

The main focus of this study is the perceived impacts of computer usage on the interactions of academic researchers with both their scholarly community and the information channels they access to gather or disseminate research information. Scholarly communities have been studied in a number of ways, including a variety of methods to study the scholars themselves as producers and users of research information. The communication process has also been studied, including the researcher's interactions within and between scholarly communities, the channels used to communicate about work, the technology adopted in the course of the work, and so forth. In addition, the contexts within which interactions take place, such as the academic research environment, also constitute an important aspect of the scholarly communication process.

The research design is obviously the result of a combination of different factors, such as:

- the focus of the study;
- the disciplinary approach used in the study;
- the theoretical foundation on which it is based;
- the context within which the investigation is carried out;
- the conceptual or empirical models that are constructed to explain the problem under investigation; as well as
- the most appropriate methods and techniques to be applied both to gather and analyse data.

The focus of this proposed study is upon three elements. The first is the scholar as an academic researcher. The second is the scholarly community, as the prime social group to which academic researchers belong and with which they interact. Finally, there is the academic research environment, which constitutes the context within which academic researchers play their professional roles.

Different approaches and theories may be applied for the study of each of these three elements. The approach chosen for this study has borrowed some concepts from both social anthropology and systems theory. Social anthropology is relevant to the intention to examine the impact of computer-mediated communication on the interactions within the scholarly community of social scientists by analysing their perceptions of this matter. The interactions themselves are not under scrutiny, but, rather, the researchers' perceptions of them, therefore some anthropological concepts can usefully to be applied to the study. In this sense, it is worth emphasising the point made by Cohen, who asserts that

> **"Community exists in the minds of its members, and should not be confused with geographic or sociographic assertions of fact… the distinctiveness of communities and, thus, the reality of their boundaries, similarly lies in the mind, in the meanings which people attach to them, not in their structural forms".(1)**

Concepts from systems theory can be applied, since the central issue of this study is the scholarly communication process. Thus, it can be discussed in terms of a human activity system, as defined by Checkland. That is,

> **"A notional purposive system which expresses some purposeful human activity, activity which could in principle be found in the real world. Such systems are …intellectual constructs; they are ideal types for use in a debate about possible changes which might be introduced into a real-world problem situation."(2)**

A conceptual model is needed to explain the relationships between the factors that can be identified as potentially important for the examination of the problem under investigation. More precisely, the model depicts the relationship between the environmental and individual factors which seem to affect, and be affected by, the use

of information technologies for research communication purposes. The theory embedded in the model has emerged from discussions with my supervisor, plus the reading of previous research findings and theoretical approaches reported in the literature reviewed.

The methodology developed to carry out the investigation has deliberately used both quantitative and the qualitative approaches. The complementary pictures provided by this combined approach can help towards an appropriate analysis of some aspects of the research topic.

The research design should lead to a cross-sectional study. It should allow comparisons and provide insights into the differences that may be occurring between scholarly communities of academic economists and sociologists.

4.2 The research conceptual model and theoretical framework

One of the prime aims of research work is to contribute to the generation of knowledge. The generation of knowledge, in its turn, is considered -in the countries of interest here- as taking place primarily in universities.(3) (This appears especially true in relation to the social sciences.) The university reward system, alongside other research assessment mechanisms, are factors which contribute to making universities a productive environment for both research work and publication. Therefore, universities appear to be an appropriate context within which to assess researchers' perceptions. Three quotations from the literature reflect such assumptions. The first asserts that

> **"The process of scholarly communication can be understood only in the context within which communication among scholars originates: the world of higher education and the academic profession."** (4)

The second discusses the (old) ideal of a university as

> **"a community of scholars; researching to advance the boundaries of knowledge, teaching to communicate that knowledge to new generations."**(5)

And finally, some comments on the academic environment as one of the best studied, asserts that

> **"It is only in the academic environment that all branches of knowledge are pushed forward together (...) The academic marketplace is both more open and more complex than others in terms of communicating research..."**[6]

Various models can be used for the study of the research environment to provide insights into the environmental issues discussed here.(7) As commented earlier, a research community within a specific scientific division of knowledge can be defined according to the academic context within which the interactions take place. In a narrow sense, a research community comprises a researcher and his or her peers carrying out research on a particular specialised topic. In a broad sense, the research community embraces all scholars in a knowledge division -the widest definition (Figure 4.1 below).

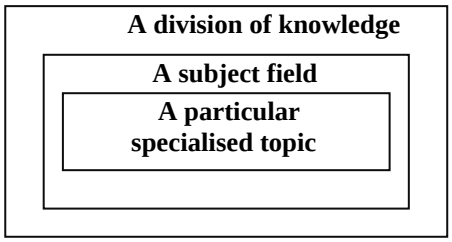

Figure 4.1

Boundaries for a research community, according to the comprehensiveness of a division of knowledge

Within such an approach, it is observed that research communities can also be studied in relation to a university as an institutional environment. The university environment encompasses an internal and an external dimension. From the internal point of view, it embraces all departments related to a specific division of knowledge plus research centres and library and computer staff. From the external point of view, it includes all individuals and groups essential for the health of the research, such as ministries of education, funding agencies, technology providers, and so forth.

In this proposed research, the research community concept adopted was drawn from the definitions mentioned above. It can be stated in terms of a *scholarly community,* which consists of an academic social scientist playing his or her role as a researcher in a university department or research centre, with colleagues carrying out research in the same topic, or writing papers together, wherever they may be -from the same university department to another continent. It is worth noting that scholarly communities, and the scholarly communication process resulting from the interactions among their members, have an international dimension and should be studied in accordance with this. It means that the boundaries of such communities cannot be related to any physical limit, but rather to a particular specialised topic.

As far as information technologies are concerned, universities are expected to provide access to computers and electronic networks for scholars. Whenever this is the case, the need of scholars to use the technological facilities available can be viewed as a result of internal (within the university environment) and/or external (environment outside the university boundaries) pressures upon them.[8] Based on these assertions, the theoretical approach stressed here takes into account issues related to pressures that might affect academic staff members in such an environment.

From a preliminary observation of such an environment it is possible to identify two similar sets of individuals and bodies, one internal and the other one external to the university. It is also possible to perceive two kinds of interactions. On one hand, there are interactions among the scholars and their scholarly community and other bodies which can be conceptually defined as pressures. In this case, the pressures seem to be stronger and more perceptible from the internal and external environment upon the researcher than vice versa. On the other hand, there are interactions defined as access to information resources. Within such interactions, scholars are studied as both producers/authors and users/readers. Access to information resources, therefore, includes both, gathering and disseminating research information.

Interactions amongst academic researchers usually take place in a university or other higher education institution, especially in its departments, which therefore constitute the prime arena for scholarly communication. Nonetheless, because of its

international dimension, these interactions extrapolate outside the internal university environment. As a consequence, events and forces that come from outside the university boundary also have an effect on those interactions and constitute other interactions per se. In this sense, the study of these events can be based on a system approach, since the model adopted can well be seen as a human activity system comprising three different subsystems, namely the university, pressures exerted upon the scholar, and information resources used by them.

From a systems perspective, Tubbs[9] proposes a conceptual model for the study of small group interactions that identifies three categories of variables (Figure 4.2). The first one comprises individual relevant background factors such as age, gender, personality, etc. The second one is related to factors that are influenced by the individual characteristics and which in turn influence the group's ultimate end results: the internal influences, including the situation, the group structure, group norms, etc. The third category of variables concerns consequences of the interactions in terms of solutions, improved information flow, organisational changes, etc. Those consequences are the outputs of the group's activities and constitute the raison d'être of a group. They are then fed back into the system through a feedback loop.

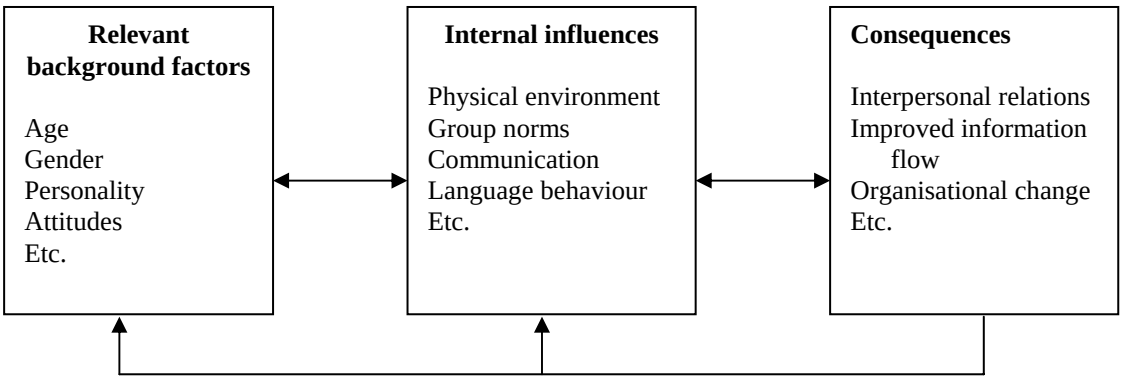

Figure 4.2
The Tubbs model of small group interaction

Tubbs model depicts a relationship in which individual characteristics influence the group context or situation, which in turn influence the group's work results. The

results are then fed back into the system. The conceptual model for the present research depicts a relationship in which individual characteristics plus environmental factors, such as pressures, influence the usage of computers for communicating research in a university environment. As a result, this usage has an effect on the interactions of the researchers with both colleagues and information resources. These results may have a feedback effect on both the use of information technologies and on individual characteristics.

The conceptual research model that depicts the relationships between the variables studied in this investigation is graphically presented below (Figure 4.3). The theory embedded in the model supposes that the internal and external pressures that accompany the introduction of information technologies into a university environment are significant factors in the use of such technologies by social scientists for research communication purposes. They lead to differences in the communication process itself. Such differences are related to the scholars' interactions within their scholarly community both informally and formally, through the information resources available in print or electronic format.

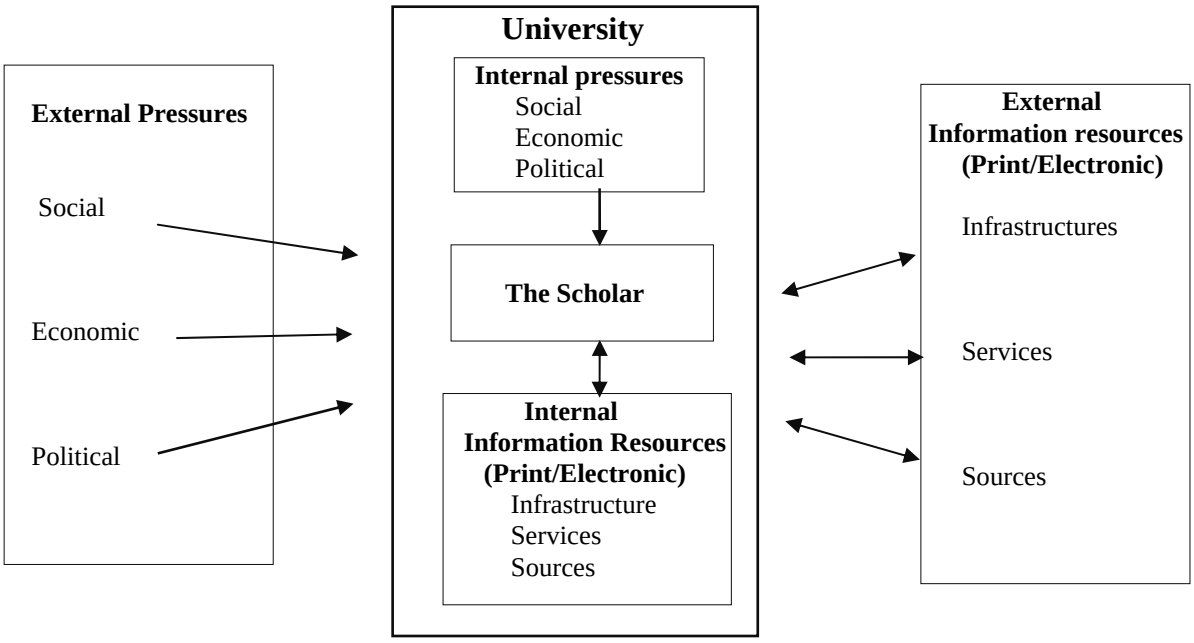

Figure 4.3

The general research model

This approach draws attention to the study of the researcher's individual characteristics, which have an effect on the use of computers and electronic networks for communicating research. Within this context, it is possible to visualise circumstances that give rise to the use of information technologies for communication purposes, as identified in the information-seeking behaviour theory illustrated in Figure 4.4 below.[10,11] One of the main elements of such circumstances is the situation within which a need for information arises, that is the PERSON, performing a ROLE in an ENVIRONMENT.

In the present study, the situation is the use of information technology for research communication. The person is represented by the academic social scientist; the role played is that of research scholar; and the environment is a university department or research centre. The researcher is indeed the focus of this investigation and, as such, has individual characteristics that can affect the use of computers for communication purposes. It is theorised that, apart from the environmental factors, individual characteristics also play a role in the use of information technologies for communicating research by social scientists, leading to different patterns of usage and perceptions of impacts.

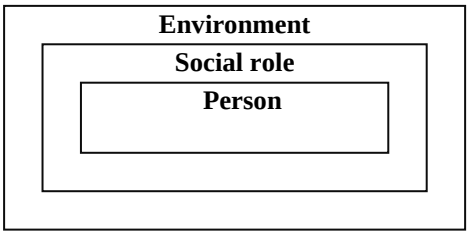

Figure 4.4
Wilson's context of information need

The relationships depicted in the general research model (Figure 4.3) involve two different sets of variables. Firstly, there are environmental factors concerned with pressures and information resources. Secondly, there are individual factors comprising personal characteristics of the scholars.

4.2.1 Environmental factors

Environmental factors have been discussed in many studies in information science. There has, however, been a diversity of foci used in such studies. In addition to this, factors related to the research contexts have been discussed in a diversified terminology. Therefore, a lack of homogeneity is found in such approaches. Nevertheless, the issues discussed contribute to the theoretical approach for this research, to the extent that social, economic, and political issues seem to be the most pervasive environmental factors. In order to have a general picture of how these issues have been approached, and which sort of variables have been studied, some previous research reports and other papers are discussed.

Factors that affected the future of on-line systems and services in the early 1980s have been studied in terms of situation and environment.(12) Within situational factors the study provides a historic review, and state-of-the-art description, by analysing the growth of on-line services and their usage, as well as technological developments and price reductions in hardware, software and telecommunications. As environmental factors, the study includes issues concerned with policies and actions from the public and private sectors that might be responsive to the situational factors analysed. The analysis focused on the beneficial and detrimental impacts of the situational factors, and on impacts of environmental factors, as they affect the information user.

Further discussion of such issues is presented in terms of changes brought about by the use of electronic facilities in scholarly communication.(13) According to this discussion, social and economic factors that are now operating in universities and in scholarly disciplines need to be examined to help explore the potential of electronic communication systems for academic organisations or for intellectual communities. These factors are analysed in terms of a new ideal for an academic community, the mores of the reward system and the economics of scholarly communication. Above all, what counts is the reward system, as related to the dominant mode of scholarly communication. It is pointed out that "if other modes of scholarly communication come to dominate, the change will rapidly be taken account of in the recognition and reward system."(14)

A less theoretical but equally interesting contribution to this discussion in terms of the variables, is found in a study of academic librarians within the context of the information society, which is bringing about important changes in the role of university librarians.(15) According to this study, although the key trends discussed are common to all types of libraries, there were particular developments in higher education over the 1980s which brought about particular change to the academic libraries. The study highlights the technological and economic aspects as the dominant forces driving librarians in this context. However, political and socio-demographic issues which have had considerable impact are also included in the discussion. Considered as pressures affecting library and information services, the factors included in the study cover environmental trends and developments, and are related to technology advances, economic forces, political influences and higher education developments.

In a recent discussion of similar aspects, i.e. the impact of the emerging information society on information professional training, roles, etc., some issues are approached as comprising environmental pressures upon them.(16) The first relates to the new information and communication technologies whose increased application to information provision requires more knowledge and understanding from librarians and information professionals. The second is the growing expectations of information users, brought about by a number of events such as direct information provision to the end user, the need for librarians to be developing Web sites that provide users with links to pre-evaluated sites, etc. The third consists of changes in the job market, as the information industry has become an economic sector of growing importance. Finally, the fourth is concerned with consequences in the information sector, in terms of information content and processing, which bring about emerging new needs.

The concept of pressure is not always clearly expressed in the four studies described above. However, it seems to underlie the majority of the issues discussed. Some inferences, for each study are stated below.

Firstly, in the study of on-line systems, the situational and environmental factors described have a component of pressure in the sense that there is an expectation that users will be able to cope with those new concepts and equipment. Another relatively

obvious sort of pressure is concerned with training needs, costs and likely changing roles and patterns. Secondly, in the discussion about scholarly communication and the electronic environment which includes the analysis of social and economic factors affecting the university environment, the analysis is basically related to significant changes in the academic community. Some of the main concerns, such as increase in student numbers, speed of change in knowledge, the dominant mode of scholarly communication and the need for considerable amounts of publication, appear to be regarded as pressures. Finally, the analysis presented in the two studies of librarians and information professionals explicitly approaches the factors affecting their roles as pressures.

Pressures

Such previous studies contribute to the concept of pressure discussed here. Pressures in the present research are concerned with different forces exerted upon the academic researcher, from the internal and external university environment, in terms of social expectations, economic restraints or encouragement, and institutional or government policies.

It has been stated that there have been increasing pressures propelling faculty members to publish as a consequence of the increasing trend of academic institutions in the 1990s to expect their members to be productive, along with the link to the reward system for demonstrated scholarship and published results.[17,18] Besides that, there have been rapid and accelerating changes within the academic environment as a result of information technology development and availability. Such changes may lead to differences in the way the scholarly communication process is performed.

With such a picture in mind, pressures are defined as social expectations, economic encouragement and political decisions from the internal and external environment upon the research scholar to communicate effectively, mainly by using computer facilities. Although this analysis could take into account a number of aspects such as historical, cultural or even ethical issues, only social, economic and political aspects were chosen for discussion, mainly due to the apparent pervasiveness of these issues

in the study of external, or environmental, factors affecting users' behaviour. Two quotations illustrate this assumption. The first one asserts that

> **"…the social, economic, and political environment around us (that) will profoundly affect what and with whom we communicate in our scholarly and educational activities, as well as how and with what resources".**(19)

According to the second one,

> **"External factors include economic, political and social factors".**(20)

Therefore, social, economic and political pressures constitute the first set of variables studied here. They are briefly defined below.

- **Social pressures**

The scholarly community in this proposed research comprises the researcher and his colleagues in terms of individuals and research groups, carrying out research in a specialised topic, or publishing together, either within a university department or outside the university environment. In this sense, social expectations come from this scholarly community, and are related to the researcher's interactions at local, national and international levels in terms of computer usage for communicating research from the most informal to the most formal level.

- **Economic pressures**

In the initial stage of this research, economic pressures were thought of in terms of financial restraints on research funding. However, after some pilot work, it seemed that what counts as economic pressures, as perceived by the scholars themselves, also includes financial encouragement in terms of investment in technological infrastructure on university campuses and outside. Free access to computer facilities for communication purposes appears to be seen as a pressure upon the scholar to make effective use of them. Therefore, economic pressures are defined in terms of financial encouragement by internal and external bodies for the researcher as an

academic scholar, which lead to expectations concerning use of the resources made available.

- **Political pressures**

Political issues, as pressures upon the scholar to use information technologies for communicating research, are mixed with economic concerns, as there always seems to be a *political* reason underlying *financial* issues. In this sense, it has been asserted that

> **"economic pressures on the public sector, in the United Kingdom at least, are no more than political pressures applied in economic terms".**(21)

Decisions made, and strategies adopted by universities and the government constitute political pressures upon the scholar using such technology. Universities constitute the scholar's institution and, in this sense, decisions taken at the institutional level may affect their use of IT. The government sector comprises the sort of bodies in charge of providing technology access to universities in terms of making resources available, subsidising costs and allowing free use. Therefore, decisions taken at the governmental level may also have an effect upon the use scholars make of IT.

Information resources

Alongside the concept of pressures, a range of information resources are involved in the environmental factors studied. Such resources are concerned with information channels and sources sought by the researcher with the ultimate objective of communicating research either in terms of gathering or delivering information. The concept of access, therefore, underlies the information resources approach. Information resources are concerned with information infrastructures, services and sources accessed by scholars in order for them to respond to perceived pressures.

- **Access to the information infrastructure**

The information infrastructure includes especially the information technology (equipment and facilities) available to academic social scientists for use in communicating research. It covers both print-related and electronic equipment and facilities provided by academic institutions, the government, publishers, libraries, bookshops, computer vendors, software houses and other private individuals and bodies.

- **Access to information services**

Information services are concerned with a range of traditional (print-related) and electronic services provided mainly by libraries and other information centres. They are sought by academic social scientists in order to find relevant research information, and are concerned with the provision of catalogues, databases, search engines, alerts, etc.

- **Access to information sources**

Information sources are concerned with primary information sources available for the academic social scientist to use. It includes the use of journals, books, conference proceedings, technical reports, and so forth, either in print or electronic format.

4.2.2 Individual factors

Individual factors comprise a set of personal attributes of the scholar as an individual performing her, or his, academic research role within a university environment. It is supposed that, besides environmental factors, there are also individual factors which can produce differences in the research communication process when the communication media change.

There are different approaches to the question of personal attributes in the literature. Besides a variety of disciplines through which individual characteristics have been studied, such as psychology, sociology, anthropology, information science and

communication science, there have also been a number of contexts within those disciplines.

Within the information science literature, especially relating to studies of information needs and uses studies, researchers have been one of the major groups under investigation. There is special concern about them as information users. In fact, scientists and engineers, social scientists and humanists, as researchers, comprise a special issue in information science studies, along with practitioners. In some fields, researchers seem to be studied to a greater extent than practitioners, though it ought to be recognised that not all fields have practitioners. The literature in the field reveals some research relating to the specific question of users' performance on information retrieval systems, or on information systems design and implementation. In this regard, it has been remarked that,

> **"Individual differences in the information retrieval domain are not assumed to be independent of individual differences related to other computing technologies".**[(22)]

It can be inferred, then, that individual characteristics studied within such a context may also be applied to the context of computer-mediated communication. Moreover, a considerable number of variables related to individual characteristics can be identified in studies on scientific communication. There is a range of psychological attributes which are brought to each situation by each scientist or scholar and which, combined with the specific circumstances, lead to individual reactions. Hence, researchers in any field show a spread of characteristics.[(23,24)]

A number of studies look at psychological attributes, individual characteristics, personal factors, etc. The terminology varies, though the aim tends to be the same: to understand the interactions of the scientist with her, or his, environment. The diversity of such characteristics is also, and obviously, related to the focus of the investigation as well as to the focus of the discussion. There has been a tentative attempt, in this research proposal, to identify the most common ones.

A number of individual characteristics can be assessed within a very broad discussion of psychological factors relating to researchers.[(25)] The first one is intelligence (i.e.

intellectual ability). This approach relates intelligence to creativity in the sense that original, creative contributions, which researchers are expected to make, need an above-average intelligence. The second characteristic is productivity, which combined with creativity underlies the two most important characteristics of researchers -the quality and quantity of information they communicate. The third characteristic in this approach is motivation, which relates to how much researchers are driven by a desire to be both productive and creative. Moreover, it is pointed out that high motivation in research is often related to a desire to be in touch with others who are equally highly motivated. The fourth characteristic is age, discussed in relation to both creativity and productivity. There are many queries about the age issue, especially in terms of the nature of the subject and publication peaks, together with seniority, which usually relates to the issue of age. The fifth characteristic is mobility, which can be defined as having two different aspects. The first is physical mobility, which consists of a 'switch' from one place to another. The second is intellectual mobility, which is concerned with a 'switch' from one field to another."[(26)]

Another interesting discussion of the role of scientific communication in the conduct of research and the creation of scientific knowledge does not discuss characteristics in detail, but simply cites individual ones such as personality, skills, style, experience, habits, etc.[(27)] They constitute psychological attributes brought by the researcher to each situation.

In the context of information retrieval systems, individual differences have been discussed as relating to information users' performance.[(28)] This study touches on five main individual characteristics - experience with computers, technical aptitude, age (which is difficult to isolate because it tends to be confounded with experience level, e.g. seniority), gender and personality. As researchers perform information retrieval as part of the research communication process, a look at the variables involved in this study can bring some insights to the present discussion.

The impact of information technology on users has been studied in the context of applied psychology and organisational behaviour.[(29)] The set of variables included was divided into four classes. Firstly, there were biographical and situational variables,

including age, gender, amount of service, job type and grade. Secondly, prior experiences and expectations were studied in terms of general attitudes to computers, expectations of the impact of computers, and influence over the design of the system. Thirdly, there were the job impact variables, including usability of a system, its functionality, its impact upon job content, demands and skill utilisation, and the level of support given to the user. Finally, users' reaction was analysed in terms of the extent of system usage, users' commitment to it, competence, mood and satisfaction and the way a system is introduced. Though very centred on the technology itself, some of these variables can enrich, and contribute to, this discussion.

From the discussions above, some individual characteristics may be regarded as more pervasive, though not necessarily emphasised as such by the studies. In general terms, age and gender have been included in a number of studies, partly because of the ease of measuring them. In the narrower context of scientific communication, creativity and productivity seem to have been observed to a greater extent than other variables. In addition, experience with computers has also been observed and studied as influencing individual attitudes. Motivation and mobility, though not greatly observed, appear as challenging aspects to include. Therefore, two sets of individual characteristics were decided on for use in this proposed study:

- **Individual demographic characteristics**

Demographic characteristics will concentrate on **age, gender, seniority** and **mobility**. These characteristics can be measured to assess their influence on computer usage as relating to the interactions of scholars.

- **Individual psychological characteristics**

Psychological characteristics are concerned with the personal attributes of scholars in terms of **motivation, creativity** and **productivity**. They can be measured in relation to computer availability and use, according to the scholars' perceptions.

4.3 The method of investigation

Social sciences constitute one division of knowledge, and comprise a number of disciplines "whose primary objective is to help understand behavioural and social phenomena."[30] The range of disciplines regarded as social sciences may vary, according to the criteria used to classify them, though most accept that there is a core number. Sociology, economics, political science, anthropology, and psychology can be considered as comprising the major social sciences. Nevertheless, psychology, though undoubtedly considered a social science, is often struggling on the blurred border between sciences and social sciences. Information science, as an essentially new and interdisciplinary body of knowledge, has also been struggling between the sciences and the social sciences, though there seems to be no doubt that most of the phenomena that it deals with are social phenomena. It is relevant to observe that

> **"While the social sciences are quite diverse, they all focus on some aspect of behaviour and social life and on institutions, technology, ideas, and aesthetic creations emanating from social interactions".**[31]

Disciplines within the social sciences division also make use of a variety of research methods. Within this arena, there has often been disagreement on the approach to be adopted, leading to discussions of the most appropriate methods and techniques in terms of validity, reliability, representativeness, generalisability, and so forth. Such discussions have engendered a heated debate about the strength and weakness of quantitative and qualitative methods.

Quantitative methods in social sciences usually involve survey research, especially in studies carried out by sociologists, although other methods are used, such as the experimental investigations used by psychologists. A survey is defined as "a method of obtaining large amounts of data, usually in a statistical form, from a large number of people in a relatively short time."[32] Survey research often makes use of questionnaires and interviews for data collection, though other techniques, such as observation and content analysis, can also be applied. The main characteristics of

surveys are that, firstly, information about the same variables is collected for a number of cases, so leading to a structured set of data; secondly, the survey analysis can either describe the characteristics of such a set of cases, or locate causes or associations, by comparing cases.[33] In quantitative research, there is "a logical structure in which theories determine the problems to which researchers address themselves in the form of hypotheses derived from general theories."[34]

Qualitative methods are often related to the use of ethnography which "involves the researcher in describing the way of life of a group of people. Such a group may be large ... or quite small ... the purpose is to describe the culture and life style of the group of people being studied in a way that is as faithful as possible to the way they see it themselves."[35] In fact, the central issue in qualitative research seems to be its concerns with "individuals' own accounts of their attitudes, motivations and behaviour ... offering richly descriptive reports of individual perceptions, attitudes, beliefs, views and feelings".[36] Ethnographic research always makes use of participant observation and unstructured (in-depth) interviewing, the former being the best known and the latter being the most common one. It has been emphasised that "qualitative research designs invariably need to allow for flexibility, and for decision making to take place as the research process proceeds."[37]

Another challenging qualitative methodology is the grounded theory approach developed by Glaser and Strauss in the 1960s. The methodology constitutes a powerful tool for handling qualitative data and formulating theoretical propositions. In fact, the term 'grounded theory' implies "the discovery of theory from data,"[38] or simply "generating theory which is embedded on data."[39] As observed later, the grounded theory approach is a

> **"general methodology of analysis linked with data collection that uses a systematically applied set of methods to generate an inductive theory about a substantive area."[40]**

Accordingly, the research product constitutes a theoretical formulation, or just hypotheses. The methodology, therefore, is not considered suitable for testing or verificational work, since a verificational approach often takes the form of a

quantitative method, such as a survey or a controlled experiment, where results are often generalisable to a population. The grounded theory task is to yield hypotheses, not to test them.

The data collection techniques, as well as the analysis methods, vary, and are interchangeably used in both research approaches, quantitative and qualitative. Interviewing, for example, can be used in quantitative or qualitative studies. So, the nature of the study, e.g. descriptive or exploratory, is crucial for decisions about the choice of research design.

4.3.1 The research design

An analytical survey approach has been chosen since the nature of the research requires a relational analysis of the variables being studied. It is hypothesised that environmental factors, such as pressures exerted by different individuals and bodies, may influence the use of information technologies by social scientists as academic researchers for communicating research. Likewise, there are a number of individual factors which may also affect IT usage. Such use, in turn, seems to bring about changes in the scholarly communication process itself. These assumptions together with some insights from preliminary information gathered from the literature led to the research design presented here. A correlational relationship between environmental and individual factors and the use of computer facilities is proposed. In addition, the study may provide insights into the impact of this usage on scholarly communication through changes that may be occurring both in the interactions between the members of the scholarly community and their access to information channels.

The main reason for adopting a survey design is that the research needs a baseline of quantitative data. Besides that, the research data cannot be gathered through an experiment, since it is not possible to observe the impacts of computer usage by manipulating the environmental or individual factors studied. A case study does not appear to be the best approach to this investigation, since there are diversified features of the environment studied, which would make if difficult to provide a ‘typical’ selection. Because of the characteristic regional differences in Brazil, neither a unique

nor a small number of institutions would provide the data that could lead to generalisations for the country as a whole.

Part of the research calls for qualitative data. Perceptions of the subjects are intended to be assessed in-depth in order to explore their own views of the issues studied and to help build up a richer picture of the problem under investigation. Consequently, the research design requires a combination of quantitative and qualitative data, using a cross-sectional approach. It is worth emphasising that a longitudinal study would not be appropriate here, as there are no previous results to follow up, neither has there been time enough to carry out an extended research project. The use of the grounded theory approach also appears to be inappropriate, since the main aim of the investigation is to test the proposed hypotheses, rather than provide new ones. Therefore, the qualitative data are to be gathered and analysed with the aim of testing the theory embedded in the research model.

4.3.2 Research population and sampling frame

Economists and sociologists have been selected to represent the social scientists in this study. There are some basic reasons for selecting these two groups of scholars. The first is that there is agreement in the literature that these two disciplines belong to the social science division. Secondly, as the subject matter has an effect on the communication pattern, the study of these two disciplines may allow comparisons that can provide insights for the study of the scholarly communication process in social sciences as a whole. On the one hand, sociology embraces a wide range of specialisms, which in turn leads to variety in the application of research methods, ranging from the most quantitative to the most qualitative. On the other hand, though economics also comprises a variety of specialisms, so leading to a diversified use of research methodology, it seems that the quantitative paradigm is the most influential in this field.

Academic research scholars constitute the main population of economists and sociologists to be investigated. It is assumed that there is a strong commitment among academic researchers to publish their results alongside the use of informal communication activities. Moreover, because of the reward system in universities,

university departments are expected to provide an ideal research environment to be studied. Therefore, the research environment for this present investigation is formed by university departments.

It is expected that developing countries may lag behind the developed ones in terms of technology availability. Some comparisons between samples of both a developing country and a developed one can provide a rich picture for the study of the impact of information technology. It was therefore decided to include two samples of scholars - the main population in Brazil with a supplementary study in the UK.

Sampling the Brazilian population

The Brazilian population was approached in two stages. The first one was via questionnaires applied to the whole population of scholars involved in post-graduate programmes in universities and 'isolated' institutions recorded by CAPES. The main reason is that

> **"In the higher education system, research is evaluated together with the post-graduate programmes, since it concentrates on this educational level. Post-graduation, amongst all educational degrees, is one that has the best structured system of permanent evaluation of programme quality, via the procedures adopted by CAPES."**(41)

The procedures for assessing higher education institutions and programmes in Brazil are defined by law and have been recently modified by the federal government.(42) According to this legislation, CAPES continues as the sole body within the Ministry of Education hierarchy with the responsibility for assessing post-graduate programmes. The institution is entitled to define, and adopt its own criteria and methodology.

Because of CAPES duties, the institution maintains a wide range of data on the post-graduate programmes in Brazil in its databases, which makes the institution's records a good data source for the sampling frame in this investigation. A special file was requested to be created by CAPES, comprising the whole range of post-graduate programmes in economics and sociology. An Excel file was generated and sent to the

researcher via e-mail as an attachment in February 1998. It contained the name of the institution responsible for each programme (a university or an isolated institution, either public or private), the main subject area (economics or sociology), the name of the programme, and the list of the academics working in each of them. CAPES also provided another file with a list containing the address of each programme.

The questionnaire sample

An initial, and careful examination was carried out of the data recorded on the CAPES file to identify possible overlaps. As in some institutions the staff for more than one programme in the same subject area were almost the same, overlaps were identified, and eliminated. After this procedure, the resultant list contained a total of 760 academics who comprise the basic sample for this investigation. The researchers are distributed accross twenty-four programmes in economics and twenty-one in sociology (Appendix 6). The programmes are offered by a total of twenty-eight institutions. Amongst those, twenty-four are public (three state and twenty-one federal) and four are private. There is a higher concentration on federal universities, as can be observed in Table 4.1 below. In terms of regional distribution, there is a higher concentration of programmes in the south-east and the north-east regions of the country, as can be observed in Table 4.2. The distribution of the various institutions is indicated in Figure 4.5.

Table 4.1

Distribution of post-graduate programmes in economics and sociology, by type of establishment (Questionnaire sample)

Type of establishment	Economics	Sociology	Total
Federal university	17	15	32
State university	3	4	7
Private university	2	1	3
Private isolated establishment	2	1	3
Total	**24**	**21**	**45**

Table 4.2

Regional distribution of post-graduate programmes in economics and sociology (Questionnaire sample)

Area	North	Northeast	Southeast	Central West	South	Total
Economics		7	12	1	4	**24**
Sociology	1	6	10	1	3	**21**
Total	1	13	22	2	7	**45**

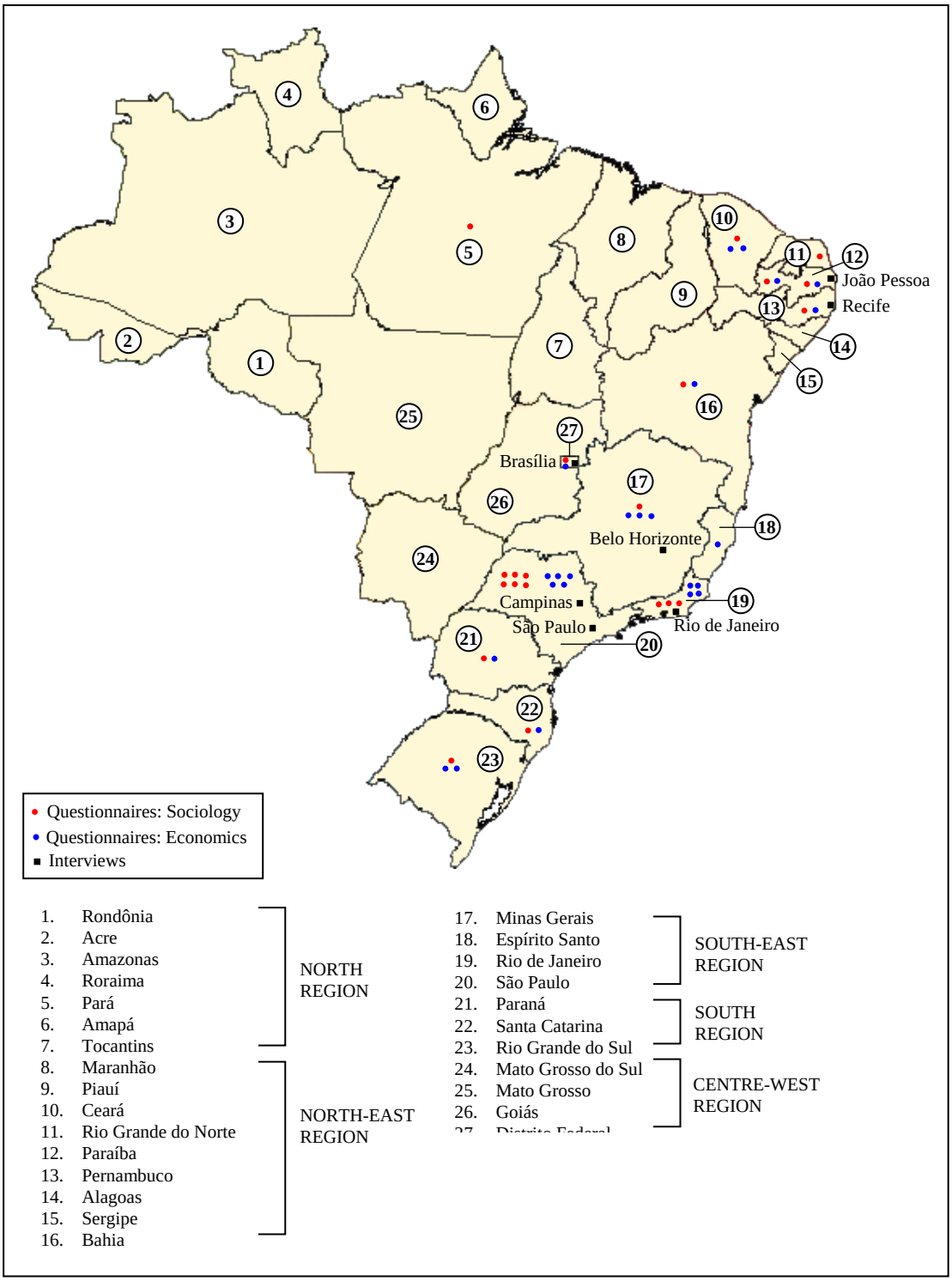

Figure 4.5

Map of Brazil showing the places involved in the questionnaire and interview surveys

The interview sample

The second stage of the investigation carried out in Brazil consisted of face-to-face interviews with a selected sample of researchers, corresponding to about 5% of the questionnaire population. It should be noted that this interview sample did not coincide with the respondents to the questionnaire, as it was not selected from the responses received, but included the totality of the programmes in the country, and was based on the criteria presented below. To be able to select the sample, three Excel files were required from CAPES records. The files were generated there, and sent via e-mail as attachments. These files contained data on the name of the programme, the main subject area, the name of the institution, the researchers' names and the number of publications produced by each researcher in 1994, 1995 and 1996.

The criteria applied to select the subjects for the interview sample are as follows. (It is worth noting that data on the specialism of each researcher, as well as on the position held by them, were not available in the files created.)

♦ Scientific productivity: this constitutes the main criterion and was applied in two stages. Firstly, a list containing the total publications for each programme in each year concerned was created, containing the number of staff, the total production, and the mean value (total production of the programme in the year divided by the number of staff members in that year). As there are differences from one year to another (the production is not always low or high every year), and also in order to allow for having the programmes sorted in descending order, the mean value of the means was also calculated and provided the data on which the selection was based. Secondly, the most productive programmes in each subject area were selected, and listed for each subject area, according to the institutions offering them. At this stage it was decided that programmes with a high mean of means but with any annual mean below 3.0 would be eliminated. The resultant list contained ten programmes in economics and eight programmes in sociology.

♦ Equal number of programmes: it was decided to include eight programmes in each subject area in the sample. The purpose for that was twofold. Firstly, it gave a reasonable balance for the two areas being studied. Secondly, as the aim was to carry

out between two or three interviews per programme, it would give an average number of thirty-two (at least) to forty-eight (at most) interviews, which corresponds to about 5% of the questionnaire population.

♦ Gender: an effort was made to include researchers from both sexes in each programme. The aim was to allow comparisons that could provide insights regarding possible differences.

♦ Geographical distribution: two programmes in economics with good productivity rates, but whose institutions were geographically distant from most of the institutions selected were not included in the final sample for cost reasons.

♦ Less productive programmes: one less productive programme was included in the sample for each subject area. The main aim was twofold: firstly, it could allow comparisons regarding possible differences that could be related to productivity; secondly, it could help to diminish the bias yielded by the productivity criterion. Fortunately, it was possible to identify a unique institution with less productive programmes in both areas, which could satisfy the criterion of geographical distribution as well. The two last programmes in the first list (most productive ones) were then replaced by these two less productive ones.

♦ Most productive researchers: after all these criteria were applied, a list of eight programmes in each area was produced (Appendix 7) and the most productive researchers in each of them were identified, according to the number of individual publications in each year. An average number of six researchers was selected in each programme. Tables 4.3 and 4.4 show the distribution of the programmes by type of establishment and regional distribution, respectively.

Table 4.3

Distribution of the post-graduate programmes in economics and sociology by type of establishment (Interview sample)

Type of establishment	Economics	Sociology	Total
Federal university	2	5	7
State university	2	3	5
Private university	2		2
Private isolated establishment	2		2
Total	**8**	**8**	**16**

Table 4.4

Regional distribution of post-graduate programmes in economics and sociology (Interview sample)

Area	North	Northeast	Southeast	South	Central West	Total
Economics		1	7			**8**
Sociology		2	5		1	**8**
Total		3	12		1	**16**

It was decided to send letters to at least five researchers from each programme, consulting them about agreeing or not to being interviewed. Along with the letters, a response form and a stamped and self-addressed envelope were included, for the researchers to reply (Appendix 8). There were ninety-two letters sent out from England, through the ordinary mail. Out of these ninety-two potential interviewees, forty-two agreed to be interviewed (twenty-two sociologists and twenty economists) and gave their telephone numbers and/or their e-mail addresses for quick further contact. Table 4.5 below illustrates these data better. These replies were sent to the Department of Information Science at the University of Brasilia, in Brazil, to be collected later on. After all the responses to the consultation letter had been collected, telephone calls and e-mails were used for arranging the interviews. More than one hundred telephone calls were made along with a few e-mails, and thirty-nine interviews were eventually arranged, twenty with sociologists and nineteen with

economists. Therefore, the interview sample in Brazil consisted of thirty-nine researchers, involving sixteen programmes and eleven institutions.

Table 4.5

Evolution of the final interview sampling

	Letters sent out	**Positive replies**	**Interviews arranged**
Economics	42	20	19
Sociology	50	22	20
Total	**92**	42	**39**

Limitations of the productivity criterion

Although a wide range of products could be identified as the researchers' outlets in the CAPES files, these data were not used in the selection of subjects for the interview sample. The main reason was technical difficulties with the Loughborough University computers. Limited disk space is provided to each research student and it did not allow the researcher to open the file created by CAPES and containing all these data, despite a number of attempts to get some help from the departmental and the Computer Centre staff. Because of that, the productivity criterion took into account the quantitative aspect of the researchers production only, using a new, smaller file created by CAPES. The qualitative aspects of the productivity, such as the type of publication produced -which could be a journal article published in an international journal, a book, or a newspaper article published in Brazil- has not been considered. Nevertheless, there are no concerns about this procedure, since it is not what they are publishing that matters, but the fact that if they are publishing, they are likely to be using computer-based techniques. Moreover, every researcher in the sample has published journal articles and/or books and conference papers over the period concerned.

Sampling the British population

The British sample for the interviews was selected according to the criteria described below. The sample was selected and studied as a pilot study carried out between

September and October 1997 (described in section 4.3.6 below). The procedures adopted consisted basically of:

♦ A search of the outcomes of the Research Assessment Exercise for 1996 on the Internet, to identify the higher graded programmes in economics and sociology, assuming that the productivity of researchers from such programmes will be high. All together, forty-two institutions with sociology and thirty-eight with economics and econometrics were listed in the 1996 Research Assessment Exercise, which was accessed via the National Information Services and Systems (NISS) homepage.(43) These lists were used as the sampling frame.

♦ Identification of the highest rated programmes in each area. The number of institutions with rates 5 and 5* selected in sociology were eight, and in economics, thirteen. As sociology at Loughborough University appeared amongst the highest rated units in the UK, and economics was rated 4 -which is still a good performance level- it was decided to select researchers from Loughborough University. (Also taking into account travelling costs).

The criteria applied to select researchers from Loughborough University departments were based on the data available on the university web site, and included basically:

♦ Specialism: people from different specialisms, e.g. quantitative versus qualitative topics within the same subject area, were selected. The main aim was to see whether there would be differences related to this issue.

♦ Position held: there was an effort to include people from all types of positions, from research assistants to professors. The main aim was to see whether the position affected the use of IT for communication purposes.

♦ Gender: there was an attempt to include people from both sexes in the selection.

In the first stage, six economists and six sociologists from the departments of social sciences and economics, in the Faculty of Social Sciences and Humanities were selected. The first four in each department, who replied affirmatively when contacted,

were definitely included in the sample. As there are economists in the business school, too, it was decided later to include four researchers from that department. Only three of them agreed to be interviewed. Therefore, the British interview sample comprised four sociologists and seven economists.

4.3.3 Data collection: quantitative and qualitative

Quantitative questionnaires and qualitative interviews constitute the two main types of survey research methods. Each approach has its own advantages.(44) Advantages related to the use of questionnaires include:

- Low cost, particularly for mail questionnaires sent to a widely spread population;
- Reduction in biasing error that may result from the personal characteristics of interviewers;
- Anonymity;
- Considered answers for those questions that demand this; and
- Better accessibility, in terms of wide geographic contact.

In relation to interviews, the main advantages include:

- Flexibility in the process of questioning;
- Control over the interviewing situation;
- High response rate; and
- Opportunity for gathering supplementary data.

In fact, the use of combined quantitative and qualitative approaches is a procedure that allows for greater confidence in the research findings, since their respective strengths can be reaped. Moreover, the presence of qualitative data may "greatly assist the analysis of quantitative data." (45) These two combined research instruments have been chosen to be used in this study for data collection, in order to achieve a well-balanced measure of the variables being studied.

4.3.4 The questionnaire survey

Mail questionnaires constituted the first stage of this investigation. As observed and recommended in the literature, the content of the questionnaire used in the study started being discussed in its early stages and only finished after the pilot work was completed.[46] After completing the stages in constructing the questionnaire, data from the Brazilian sample were gathered through mail questionnaires. This decision on administering questionnaires by mailing them to the respondents was made especially taking into account that:

- Mail questionnaires are the best method for collecting large amounts of data from a large population over a wide geographical area in a short period of time;

- It would be financially difficult to distribute personally administered questionnaires to the Brazilian sample, considering that post-graduate programmes in economics and sociology are widely dispersed across its huge territory, as can be observed in the Brazilian map provided.

The disadvantages of mail questionnaires are well known and widely discussed in the literature. The main concerns are with the response rates and the bias produced by non-responses. However, a number of procedures were adopted to prevent this, as recommended by Heather & Stone,[47] and by Dillman.[48] The procedures adopted include:

- Keeping the questionnaire as clear, short, unambiguous and easy to analyse as possible.

- Coding each questionnaire on the right top corner and keeping a record of the codes and corresponding names and institutions, to allow further contacts.

- Stating the name of each researcher, and the programme/institution, on the top of the cover letter that accompanied the questionnaire, which was dated, printed on headed (Loughborough University) paper, and signed.

- Attaching an individual page with the research outline to the questionnaire, specifying the research topic, aims, relevance, etc.

- Thanking respondents for their co-operation.

- Posting all questionnaires at the same time.

- Enclosing stamped and self-addressed envelopes for reply.

- Specifying the appropriate time by which respondents should reply.

- Making follow-up contacts with non-respondent programmes.

The questionnaire form comprised three sets of questions (Appendix 1) that helped to build up a picture of:

- experience with computers and situational factors, such as technology availability, level of electronic connectivity, and frequency of use of both print-related and electronic information resources (questions 1-6);

- demographic aspects of the respondents (question 7-12), and the researchers' motivation for publishing (question 13); and

- the level of agreement with a series of statements using a Likert scale (question 14).

First delivery of questionnaires

All the questionnaires were taken from England to Brazil by someone designated for that, and were posted there, in March 1998. The labels on the self-addressed envelopes provided for the replies gave the address of the Department of Information Science at the University of Brasilia. There, one person was in charge of collecting the responses, photocopying them for security reasons, packing them in sets of around thirty, and sending the packages to the Department of Information Science at Loughborough University where the questionnaires could finally be collected and kept for analysis. This procedure required some time to be performed, leading to a considerable delay in the receipt of the questionnaires in the UK.

The questionnaires were sent along with a cover letter and the outline of the research (Appendices 2 and 3). A month before sending the questionnaires, an initial letter was sent to all post-graduate programme co-ordinators, advising them about the survey and asking them to inform the staff at their next staff meeting. In this first delivery, the questionnaires were sent in packages to the programme co-ordinator. Reminder letters had also been sent to co-ordinators (as it would be extremely expensive to send them from the UK to Brazil for each non-respondent researcher in the sample). Control procedures for the reception of the questionnaires were performed by the researcher in the UK, via a list of questionnaire codes and researchers' names and institutions.

Second delivery of questionnaires

As soon as the first questionnaires had been distributed in Brazil, a strike took place in all federal universities. This strike lasted for three months, and led to a very low response rate (less than 20%), since the majority of the respondents worked in these institutions. It was therefore decided to send a second copy of the questionnaire to all those researchers who had not replied, accompanied by another cover letter (Appendix 4).

The second delivery and collection of the questionnaires followed the same procedures as the first one, and comprised the same set of documents, with changes being made to the cover letter. This time the questionnaires were taken to Brazil by the researcher herself, as it was decided to do the distribution at the same time as the interview survey was carried out, that is, at the beginning of August 1998. In this second delivery, the questionnaires were still sent to the address of each post-graduate programme, but this time they were sent in individual envelopes addressed to each researcher. All the replies were collected from the Department of Information Science at the University of Brasilia in October 1998, when the interview survey finished, and the questionnaires were brought back to England by the researcher.

A personal distribution was done in the institutions where interviews were taking place. Every researcher met was asked whether, or not, he or she had received, and replied to the questionnaire. To those who had neither received nor replied (very few)

a third copy was handed out, together with a self-stamped and addressed envelope for them to reply.

4.3.5 The interview survey

The second stage of data collection was carried out via interviews. The main aim was to gather qualitative data in order to obtain a rich description of the scholars' perceptions of the impact computer usage was having on their interactions within their scholarly communities. The intention was to extend the data obtained from the questionnaires, and so obtain sufficient detail for a more in-depth study. In such a combined approach,

> **"The qualitative study is often carried out before the survey as an exploratory first step that paves the way as well as offering a greater depth of information to complement the quantitative survey results. Alternatively the qualitative study can be carried out after the main survey, which can then provide a rich sample for selecting particular types of respondent for in depth interviews. This type of linkage greatly extends the survey results in a statistical context by directly linking the two sets of data".**(49)

Within this investigation, both strategies were adopted. In a first, exploratory step, interviews were carried out in the UK as a pilot study. The main study then followed, comprising the questionnaires and the interview surveys in Brazil. For this second step of the qualitative study, a particular type of respondent for in-depth interviews (basically the most productive ones, as stated before) was selected.

Carrying out interviews in Brazil

As the sponsor of this research programme, CAPES, provided the air tickets for the interview survey to be carried out in Brazil. The tickets included flying from England to Brazil, the domestic flights in the Brazilian territory, and the return flight to England. All the connections between the Brazilian cities were made via air flights. An idea of the distances covered can be obtained by looking at the Brazilian map provided in this chapter. As remarked previously, geographically speaking, the institutions visited were concentrated in the south-east and north-east regions of the

country. It is worth emphasising that higher education in economics in Brazil, especially at post-graduate level, is highly concentrated in the south-east.

As stated before, the initial number of interviews arranged were thirty-nine. However, since three economists did not appear for the interviews, the final number of interviews carried out in Brazil was thirty-six, involving fifteen programmes from ten institutions.

The interview fieldwork started on 3rd August 1998 and ended on 8th October 1998. The first two weeks in Brazil were spent in Brasília and were used either to phone, or e-mail the researchers who had agreed to be interviewed, and to finalise arrangements for the interviews. The interviews were then carried out in seven different cities, as described below. The researcher stayed in each city for one or two weeks, depending on the number of interviews.

♦ Brasília-DF, the capital of the country, in the centre-west region, and the home place of the researcher. While in Brasília, from where the interviews were arranged, two interviews with sociologists from the University of Brasilia were carried out. One interview took place on the university campus and the other in the interviewee's office in a governmental institution.

♦ João Pessoa, capital of the state of Paraíba, in the north-east. In total, six researchers were interviewed, three from the post-graduate programme in economics and three in sociology. Altogether, five interviews were carried out on the campus of the Federal University of Paraíba and one in the interviewee's private office.

♦ Recife, capital of the state of Pernambuco, in the north-east. Altogether, three interviews were carried out in Recife with researchers from the post-graduate programme in sociology on the campus of the Federal University of Pernambuco.

♦ Belo Horizonte, capital of the state of Minas Gerais, in the south-east. Altogether, three interviews were carried out, one with an economist and two with sociologists. The sociologists were located on the campus of the Federal University of Minas

Gerais, whilst the economists were in the city centre, where their research centre is located.

♦ Rio de Janeiro, capital of the state of Rio de Janeiro, in the south-east. In total, six interviews were carried out in Rio de Janeiro, with three economists from the Getúlio Vargas Foundation, a private isolated establishment, and three sociologists from the Federal University of Rio de Janeiro. The interviews took place in three different places: two in the Getúlio Vargas Foundation building, three in the Institute of Sociology of the Federal University of Rio de Janeiro, which is off the main campus, and one in a private office.

♦ São Paulo, capital of the state of Sao Paulo, in the south-east. Eleven interviews were carried out in São Paulo. From the University of São Paulo, a state university, there were two economists and five sociologists. The sociologists belonged to two different programmes. At the Pontifical Catholic University of São Paulo, a private university, two economists were interviewed. At the Getúlio Vargas Foundation, a private isolated establishment, two economists were interviewed. The interviews took place on each of the three campuses of the institutions involved, except for one economist, who was a minister in the government and asked for the interview to be done in his private office in the city centre.

♦ Campinas, one of the biggest cities in the state of São Paulo, near the city of São Paulo. There were five interviews carried out in Campinas, three with economists and two with sociologists, all from the University of Campinas, a state university. All the interviews took place on the university campus, in the researchers' offices.

All the interviews, both in Brazil and the UK, were carried out in the researchers' offices in their work places, and were tape-recorded for further analysis. The strategies recommended by Poland for ensuring high-quality tape recording, and therefore maximising transcription quality, were followed and are described in Table 4.6 below.[(50)]

Table 4.6

Strategies adopted for ensuring high-quality tape recording

I.	Equipment
	Batteries were used and checked before using. No more than four interviews were carried out using the same batteries.
	The recorder was kept clean and in good condition (it was a new one), and checked before each interview.
	At least two extra tape cassettes and four extra batteries were taken along to each interview.
II.	Before the interview
	Researchers' offices were chosen as an appropriate place for the interviews.
	The microphone was put as close as possible to the interviewees.
	The recorder was always set on a table.
	The recording system was checked before all the interviews.
III.	During the interview
	The interviewer spoke clearly and slowly as recommended.
	A test with the interviewee was made at the beginning of each interview, the tape being rewound and listened to so that both the interviewee and the interviewer could hear whether they were speaking distinctly.
	All sorts of noise were avoided.
	Each interview was recorded on one side of the tape only, using 90-minute tapes of high quality. There was never any need to change tapes.
	At the beginning of each interview, interviewees were asked to state their names clearly.
IV.	After the interview
	Tapes were labelled, listened to, and returned to their containers.
	Tapes and recorder were kept in good conditions.

The interviews lasted for 20 to 40 minutes. As recommended in the literature, an interview schedule (Appendix 5) was followed in all of the interviews, though used informally in a relaxed atmosphere. The questions were presented in the same order to each interviewee, and asked as worded in the interview schedule. The interviewer

followed up and clarified the meanings of the relevant aspects of the answers throughout the interview, as suggested by Kvale.[51]

4.3.6 The pilot study

An exploratory first step was undertaken to help test both the research model adopted and the methods of data collection chosen. For this, two pre-testing procedures were performed. In the first one, eleven interviews were carried out with a British sample. The second one consisted of sending questionnaires to a small Brazilian sample. Both procedures are described below and were performed in order to provide an indication of the suitability of the questions and of any problem that might occur during the main survey.

Pre-testing interviews

The procedures carried out to pilot the interviews aimed to examine what would happen when the interviews took place and to test some concepts used in the research model. Recommendations found in the literature were kept in mind throughout the pilot interviews, such as:

- Following the interview schedule, though using it informally;
- Conducting the interview in a relaxed atmosphere;
- Asking the questions exactly as worded in the schedule;
- Presenting the questions in the same order as in the schedule;
- Repeating and clarifying questions that were misunderstood or misinterpreted.

The steps followed to pilot the interviews consisted of:

- Selecting the sample to be approached.

- Sending formal letters to the Heads of Departments, asking for permission to contact the staff members.

- Sending formal letters to staff members

- Contacting staff members via telephone, to arrange the interviews.

- Interviewing the staff members.

A preliminary analysis of the data gathered through the British interviews was carried out in order to familiarise the researcher with the analysis procedures. Besides that, an assessment of the concepts used in the research model as well as the evaluation of the interview schedule itself was possible.

Pre-testing questionnaires

The procedures to pilot the questionnaire were designed to assist in its evaluation. Suggestions offered by De Vaus were adopted; these consisted of:

- Evaluating similar answers to questions to analyse their use in later analysis. Items with no variation should be eliminated;

- Checking the understanding of the intended meaning of the questions by the respondents and of the answers by the researcher;

- Observing whether there were refusals by a large number of people to answer any particular question.

The steps followed to pilot the questionnaires consisted of:

- Definition of the sample to be approached. It was decided to contact staff members of the departments of economics and sociology at the University of Brasilia in Brasilia-DF, Brazil, where the researcher herself works and knows a number of people. This familiarity should allow greater freedom and interest in making suggestions. A total of fifty-two questionnaires was sent.

♦ Sending formal letters to the Heads of Departments, asking for permission to contact the staff members, in September 1997.

♦ Sending the questionnaires in October 1997 to one person in charge of distributing, collecting and keeping them in the Department of Information Science at the University of Brasilia.

• Collecting the responses personally, in December 1997.

In order to become familiar with the statistical procedures required, the data collected in the questionnaire were analysed using SPSS. Such analysis included: coding the data, creating a SPSS file, inputting the data and running a number of frequencies and cross-tabulations. The pilot study was essential for testing the instruments. According to the results from both -the questionnaires and interviews- a few modifications were introduced.

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CHAPTER FIVE

DATA ANALYSIS: QUESTIONNAIRES

5.1 Introduction

In order to study the impact of IT usage on the scholarly communication process amongst economists and sociologists in Brazil, a survey method was used to gather data from the social scientists themselves, using two instruments in two different stages. The first instrument was a questionnaire, through which data were gathered on a number of variables grouped as demographic characteristics, mobility, motivation, expectations, computer usage and the use of electronic versus traditional resources. The second one was a semi-structured interview, through which the social scientists' perceptions of the problem were obtained. The first stage consisted of piloting the interviews with a British sample. The second one involved administering questionnaires to the Brazilian population of researchers from post-graduate programmes in economics and sociology, and carrying out interviews with a small sample of them.

This chapter presents the analysis of data collected from the questionnaire survey and describes the main characteristics of the population, as well as identifying some differences between the two communities studied. The first part of the chapter, from sections 5.2 to section 5.6, is related to frequencies of data regarding each community. The second part, from sections 5.7 to section 5.10, is concerned with other relationships between the data and some comments from the respondents.

The scope of the questionnaire survey was the total population of researchers working in post-graduate programmes in economics and sociology in Brazil. A total of 760 researchers working in 45 programmes offered by 28 institutions therefore comprise

this population. A total of 760 questionnaires were sent via ordinary mail to researchers throughout the country. Of these 760 questionnaires, 51.2 percent (389) were sent to economists and 48.8 percent (371) were sent to sociologists.

Out of the 760 questionnaires sent out, 487 were ultimately returned, giving a 64.1% response rate, which can be considered good, taking into account the difficulties faced with this data collection, as reported in the methodology chapter. In relation to the whole population, of the 487 questionnaires returned, 53.8% (262) were from economists and 46.2% (225) were from sociologists. The response rates for each subject area were therefore 67.4 percent in economics (262 out of 389) and 60.6 percent in sociology (225 out of 371). The data analysis presented here is related to seven aspects:

- Demographic characteristics of the respondents in terms of age, gender, seniority and mobility.
- Computer usage in terms of numbers of years experience, computer availability and networking, as well as average use.
- The use of traditional versus electronic resources in terms of equipment, facilities, sources and services.
- Motivation of the respondents for publishing.
- Expectations with regard to the use of IT for communication purposes, from the researchers themselves and from their scholarly community.
- Common use of information resources.

5.2 Demographic characteristics of the respondents

The first step in this analysis aims to describe the demographic characteristics of the respondents, in order to provide a general picture of the population. These data are presented for economics and sociology separately, to allow comparisons that can be

useful to explain differences and similarities between economists and sociologists. Data at the top of each table show the chi-square value, the degree of freedom, and the coefficient of significance.

5.2.1 Age

Table 5.1 compares the number of respondents in each community by age ranges. The results obtained show that there are differences between economists and sociologists in terms of age distribution in this study. In both communities the great majority of the respondents are concentrated in the range between 41-60 years old, that is, 71.8 percent of economists and 79 percent of sociologists are in this range. Indeed, the main concentration (above 40 percent) is in the range between 41-50 years old. Nonetheless, sociologists are slightly older than economists, as there are more sociologists than economists who are more than 50 years old. On the other hand, there are more economists than sociologists who are under 40 years old. There is a possible statistical significance of the differences in age between the two samples, since it correlates at the 0.05 level of confidence.

Table 5.1

Distribution of respondents by age

(N=486)

X^2=12.738 df=4 p= .013

Age	**Economics**		**Sociology**	
	F	%	F	%
30 or less	6	2.3		
31-40	56	21.4	34	15.2
41-50	120	45.8	95	42.4
51-60	68	26.0	82	36.6
61 or more	12	4.6	13	5.8
Total	262	100.0	224	100.0

5.2.2 Gender

Table 5.2 compares the distribution of the respondents by gender in each community. It shows that there is a significant difference in the distribution of economists and sociologists in the study. Male researchers predominate amongst economists, since

only 16 percent of them are female. On the other hand, sociologists are more equally distributed in terms of gender, though there are also more males than females amongst them (55.4 percent of male and 44.6 percent of female). The statistical significance of the differences between the two communities in terms of gender is high, as it correlates at the 0.01 level of confidence.

Table 5.2

Number of respondents by gender, per area of study

(N=486)

X^2=47.802 df=1 p= .000

Gender	**Economics**		**Sociology**	
	F	%	F	%
Male	220	84.0	124	55.4
Female	42	16.0	100	44.6
Total	262	100.0	224	100.0

5.2.3 Seniority

Seniority is measured in this research in terms of two different variables. The first one is the highest degree obtained by the researcher. The second one is the position of the researcher in terms of university position.

Table 5.3 compares the number of economists and sociologists in terms of the highest degree obtained and gives a picture of the status of the population studied. The results show that the number of respondents without PhD/DSc in both communities is small. PhD's and DSc's form the overwhelmingly predominant group.

For the two communities studied, though the percentage of economists with PhD/DSc is slightly higher than that for sociologists, there is no statistically significant difference between them. It is worth noting that data on the category **Others**, which actually contains respondents with the *Livre Docente*[*], could be added to the category PhD/DSc, since that title is given only to people with this qualification. Doing so,

[*] *Livre Docente* is a title that is given to doctors who complete a further work, similar to another thesis on a specific topic and defend it before a special committee. The work is usually published as a book.

brings the data for the two communities much closer, as the percentage of doctors becomes 93.5 percent in economics and 93.3 in sociology.

Table 5.3

Distribution of respondents by highest degree, per area of study

(N=486)

X^2=7.495 df=3 p= .058

Highest degree	Economics		Sociology	
	F	%	F	%
PhD/DSc	241	92.0	197	87.9
MSc/MA/MPhil	15	5.7	15	6.7
Specialist	2	0.8		
Other	4	1.5	12	5.4
Total	262	100.0	224	100.0

Table 5.4 shows the distribution of economists and sociologists in terms of position. The Brazilian system of ranking differs from the British one. However, in order to facilitate understanding, an adaptation (correspondence) has been applied to indicate position on the British system. According to the results obtained, although there is a slight difference between sociologists and economists in this matter, there is no statistical significance for these differences. The population within the two communities is concentrated into the categories professor and senior lecturer (82.4 percent of economists and 83.8 percent of sociologists). A slight difference was found relating to the higher number of professors amongst economists, whereas the number of senior lecturers is higher amongst sociologists.

Table 5.4

Number of respondents by rank

N=484

X^2=8.108 df=4 p= .230

Rank	Economics		Sociology	
	F	%	F	%
Professor	76	29.0	47	21.2
Senior lecturer	140	53.4	139	62.6
New doctorate	16	6.1	8	3.6
Lecturer	29	11.1	27	12.2
Research student	1	0.4	1	0.4
Total	262	100.0	222	100.0

5.2.4 Mobility

Mobility is defined in terms of both intellectual and physical mobility. Accordingly, intellectual mobility is analysed in relation to the number of years working in the same specialism whereas physical mobility is analysed according to two categories of data. The first one is the world region in which respondents graduated. The second one is the number of years working in the same institution.

Intellectual mobility

Table 5.5 compares the number of respondents for each community in relation to intellectual mobility. According to these data, the population studied presents a very low degree of intellectual mobility. The majority of the respondents within the two communities have been working in the same specialism for more than 10 years. Sociologists showed even less intellectual mobility than economists, as a higher percentage of them (73.2 percent) fall in this category. There is a statistical significance in the difference between the two communities studied, since it correlates at the 0.01 level of confidence.

Table 5.5

Number of respondents by years of working in the same specialism

(N=486)

X^2= 9.530 df=2 p=.009

Number of years	**Economics**		**Sociology**	
	F	%	F	%
Up to 5	48	18.3	20	8.9
5-10	49	18.7	40	17.9
More than 10	165	63.0	164	73.2
Total	262	100.0	224	100.0

Physical mobility

In terms of physical mobility, the data also revealed a low degree of mobility, in terms of both variables studied, namely 'same institution' and 'world region'. Table 5.6

compares the data relating to the number of years working in the same institution. Data gathered in this study revealed that there is a slightly lower mobility amongst sociologists than amongst economists. More of the former are in the categories above 10 years of working (71 percent of sociologists fall in these categories, whereas 62.8 percent of the economists do), though the difference is not statistically significant.

Table 5.6

Number of respondents by years of working in the same institution

N=485

X^2=4.902 df=3 p= .179

Number of years	Economics		Sociology	
	F	%	F	%
Less than 5	47	18.0	33	14.7
5-10	50	19.2	32	14.3
10-15	47	18.0	37	16.5
More than 15	117	44.8	122	54.5
Total	261	100.0	224	100.0

In relation to the world region where respondents graduated, the data reveal that there is fair mobility, since 49.2 percent of economists and 42.2 percent of sociologists graduated abroad, as shown in Table 5.7. Amongst these, a larger number of sociologists graduated in Europe than in the USA, whereas more economists graduated in the USA. Nevertheless, the majority of the researchers in the two communities graduated in Brazil. Although the difference between sociologists and economists correlates at the 0.01 level of confidence, it is not a valid correlation because there are more than 25 percent of cells counting less than 5.

Table 5.7

Number of respondents by world region, per area of study

(N=485)

X^2=14.823 df=4 p= .005

World region	Economics		Sociology	
	F	%	F	%
USA	68	26.0	28	12.6
Europe	57	21.8	61	27.4
Asia			1	0.4
Latin America and Caribbean	4	1.5	4	1.5
Brazil	133	50.8	129	57.8
Total	262	100.0	223	100.0

5.3 Computer usage

Three different variables measure computer usage. The first is the period of time over which respondents have been using computers for communication purposes. The second is the availability of computers. Finally, the third is the average use of computers by the respondents. Each of these variables is described below.

5.3.1 Years of using computers

Table 5.8 compares the distribution of economists and sociologists according to the number of years over which they have been using computers for research communication purposes. The results obtained reveal that there are differences between the two communities studied, since sociologists have been using computers longer than economists. Actually, more than 50 percent of the sociologists have been using computers for more than five years, whereas more economists have been using them for less than five years, or not using them at all. There is a possible statistical significance in this difference, as it correlates at the 0.05 level of confidence.

Table 5.8

Number of respondents by years of using computers, per area of study

(N=466)

X^2=6.300 df=2 p= .043

Years of using computers	Economics		Sociology	
	F	%	F	%
Not using	23	9.2	18	8.4
Less than 5 years	126	50.2	85	39.5
More than 5 years	102	40.6	112	52.1
Total	251	100.0	215	100.0

5.3.2 The availability of computers

Data on the availability of computers were indirectly measured according to both the responses of actually using them in terms of average use and responses for 'Never but Available'. Computer networking is measured in terms of the reported use of networked computers themselves. In terms of availability, the results in Table 5.9 reveal that the majority of the respondents both in economics and sociology have computers available for them to use, either at home or at work. However, although not statistically significant, there are differences between economists and sociologists in this matter. According to the responses obtained, a higher percentage of the latter have computers available at home. On the other hand, a higher percentage of the former have computers available at work, especially networked computers on their own desks.

As regarding computer networking only, data for both communities show a lower percentage of networked computers at home, as compared with the work environment, again especially amongst economists. Data regarding the availability of networked computers somewhere else at work show the same percentage for both communities. The statistical significance of the differences is presented with data on average use.

Table 5.9

Computer availability and connectivity level

Type of computer	N	p	Economics				Sociology			
			Av.		N/Av.		Av.		N/Av.	
			F	%	F	%	F	%	F	%
Stand -lone at home	413	.056	191	88.8	24	11.2	184	93.0	14	7.0
Networked at home	336	.127	76	40.9	110	59.1	72	48.0	78	52.0
Stand-alone at work	307	.042	137	81.5	31	18.5	108	77.7	31	22.3
Networked on their desk	376	.009	171	77.7	49	22.3	92	59.0	64	41.0
Networked at work	293	.748	112	72.7	42	27.3	101	72.7	38	27.3

A large number of missing values was found in this question, alongside a high percentage of 'never used' (Table 5.10). Therefore, low responses to most of the items in the question probably reflects non-use. Nevertheless, as observed in Table 5.8, circa 90 percent of the respondents is using one or other type of computer.

5.3.3 The average use of computers

Figures 5.1a and 5.1b show the results for the average use of computers by each community of respondents, according to the type of computer used. As can be observed, there are differences in the patterns of average use of computers by economists and sociologists. In terms of stand-alone computers, both communities are using them more at home than at work, especially sociologists. Conversely, in terms of networked computers, both communities are using them more at work than at home, especially economists.

The major difference, correlating at the 0.01 level of confidence, is related to the use of networked computers on the researchers' desks, which involves a much higher number of economists than sociologists. A possible statistical significance is observed in relation to stand-alone computers at work, as there are more economists using them. The differences in this case correlate at the 0.05 level of confidence.

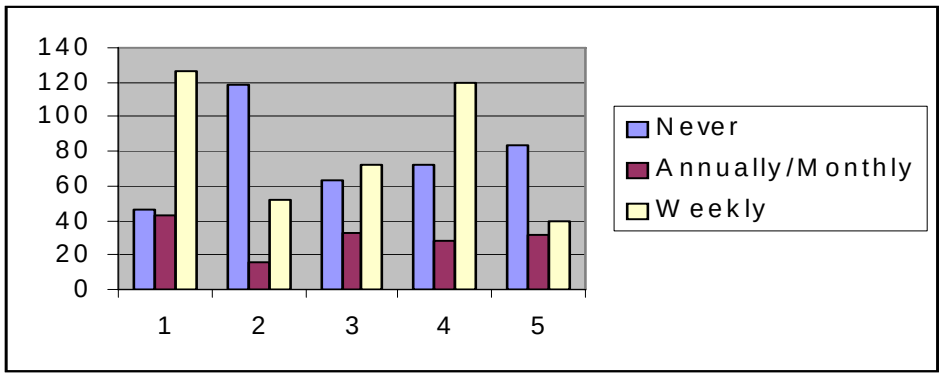

Figure 5.1a
The breakdown of use of computers by economists

1=Stand-alone at home 2= Networked at home 3=Stand-alone at work 4=Networked on desk 5=Networked at work

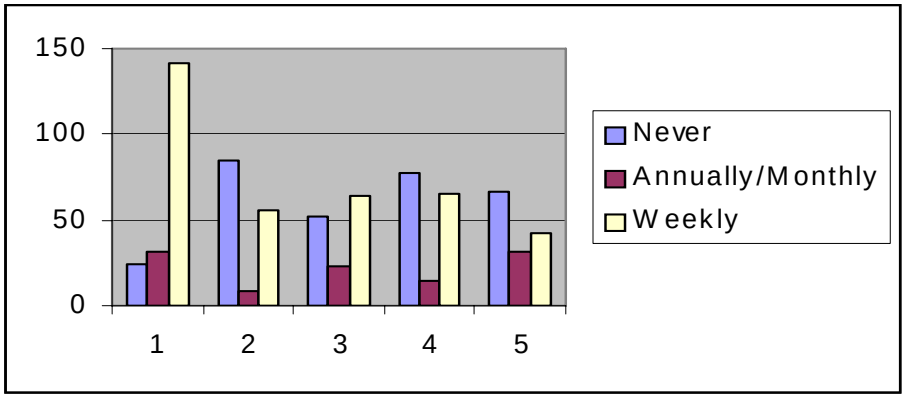

Figure 5.1b

The breakdown of use of computers by sociologists

1=Stand-alone at home 2= Networked at home 3=Stand-alone at work 4=Networked on desk 5=Networked at work

5.4 The use of electronic and traditional resources

Questions number two to five in the questionnaire measured the use of both traditional and electronic resources in terms of equipment, information facilities, information sources and information services. The aim was to see whether there are differences in the patterns of use between economists and sociologists. The results are described below, for each of these groups of variables. It is worth noting that these data have been collected in terms of average use. Six categories of frequency appear in the questionnaire, namely 'never (available)', 'never (not available)', 'at least one a year', 'at least one a month', 'once a week' and 'many times a week'. For a clearer understanding, these categories have been compressed into three, namely 'never', 'annually/monthly' and 'weekly'.

5.4.1 The use of electronic and traditional equipment

Respondents were offered a number of options relating to both electronic and traditional equipment used for communication purposes. Respondents were asked to reply according to the average frequency of use. Table 5.10 shows the results of such use by the whole population investigated.

The data gathered revealed that both economists and sociologists still make a high use of traditional equipment, such as telephones and photocopiers. Typewriters are the traditional equipment now least used by both communities, with a high percentage of 'Never using' (73.3 percent). Most of those who are using them are doing so on an annual/monthly basis.

The most reported electronic equipment used was the stand-alone computer, used at home, mainly weekly. Facsimile and networked computers on the researcher's desk follow, also mostly used on at least a weekly basis. The least reported electronic equipment used was a networked computer used somewhere else at work, with more than 50 percent 'Never using'.

Table 5.10

The breakdown of use of equipment by the whole population

Equipment	Never		Annually / Monthly		Weekly		Total
	F	%	F	%	F	%	
Stand-alone computers at home	70	17.0	75	18.1	268	64.9	413
Networked computers at home	203	60.4	25	7.4	108	32.1	336
Stand-alone computers at work	115	37.5	56	18.2	136	44.3	307
Networked computers on their desks	149	39.6	42	11.2	185	49.2	376
Networked computers somewhere else at work	149	50.9	63	21.5	81	27.6	293
Fax	54	13.7	158	40.0	183	46.3	395
Typewriters	285	73.3	79	20.3	25	6.4	389
Telephone	35	7.6	62	13.4	366	79.0	463
Photocopier	24	5.2	101	21.9	337	72.9	462

Figures 5.2a and 5.2b give the results for the average use of electronic and traditional equipment for communication purposes by each community of researchers. Chi-squared tests were applied to all categories of equipment against the two categories of communities. Out of the nine categories of equipment, three correlated significantly with the type of community. Stand-alone computers at work correlated at the 0.05 level of confidence, whereas networked computers on the researchers' desks and typewriters correlated at the 0.01 level of confidence. Both stand-alone computers at work and networked computers on the researchers' desks are more used by economists, whereas typewriters are more used by sociologists.

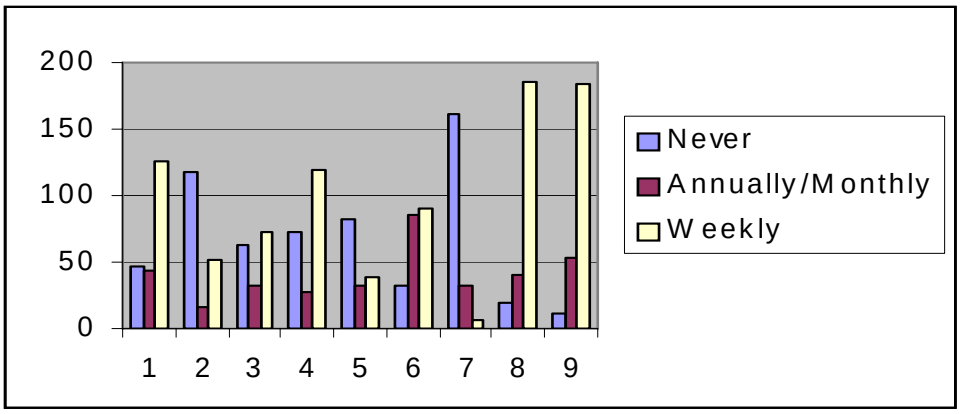

Figure 5.2a

The breakdown of use of electronic and traditional equipment by economists

1=stand-alone computer at home 2=networked computers at home 3=stand-alone computers at work 4=networked computers on their desks 5=networked computers at work 6=facsimile 7=typewriter 8=telephone 9=photocopier

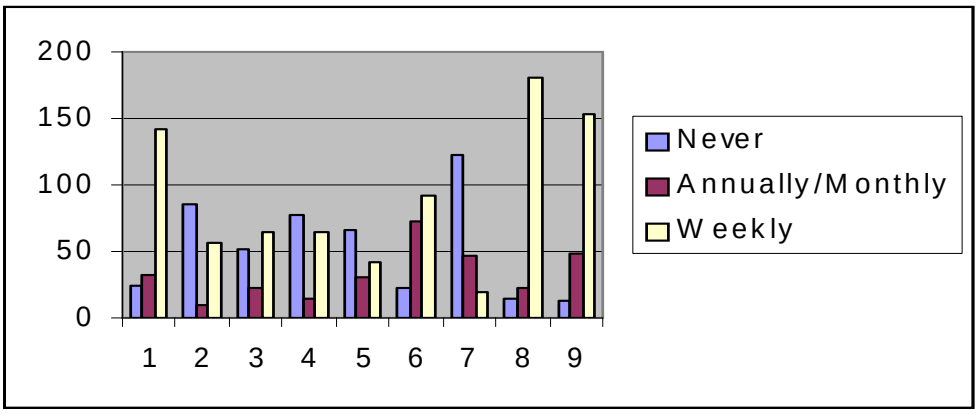

Figure 5.2b

The breakdown of use of electronic and traditional equipment by sociologists

1=stand-alone computer at home 2=networked computers at home 3=stand-alone computers at work 4=networked computers on their desks 5=networked computers at work 6=facsimile 7=typewriter 8=telephone 9=photocopier

5.4.2 The use of electronic and traditional facilities

Question number three offered respondents eight options relating to electronic and traditional facilities where researchers can find information sources. Table 5.11 shows the average use of those facilities by the whole population. According to the results obtained, there has been a move towards the use of electronic facilities, especially web sites, which had 78.6 percent of the respondents using them with 57.2 percent using the university web site. Bulletin boards constitute the least used facility by these communities of researchers. Libraries, bookshops and publishers' catalogues are the most used facilities. There were 95.9 percent of the social scientists using their academic library and 87.3 percent using other libraries. Regarding bookshops, the most used facility, there were 96.6 percent of the respondents using them, alongside publishers' catalogues used by 93.0 percent. Facilities that are most used on a weekly basis are web sites and the university library. Publishers' catalogues and other libraries are more used on an annual/monthly basis. Colleagues' archives constitute the least used traditional facility and are mostly used annually or monthly.

Table 5.11

The breakdown of use of facilities by the whole population

Facility	Never		Annually / Monthly		Weekly		Total
	F	%	F	%	F	%	
Library Web site	186	42.8	164	37.7	85	19.5	435
Other Web sites	95	21.4	143	32.3	205	46.3	443
Bulletin boards/Discussion lists	187	45.5	126	30.7	98	23.8	411
University library	20	4.1	219	45.7	241	50.2	480
Other libraries	57	12.7	319	71.2	72	16.1	448
Bookshops	16	3.4	315	66.4	143	30.2	474
Publishers' catalogues	32	7.0	376	82.0	51	11.0	459
Colleagues' archives	167	38.4	241	55.4	27	6.2	435

Some differences have been found in relation to the patterns of use of electronic and traditional facilities. Figures 5.3a and 5.3b show the results of the average usage of electronic and traditional facilities by economists and sociologists, respectively.

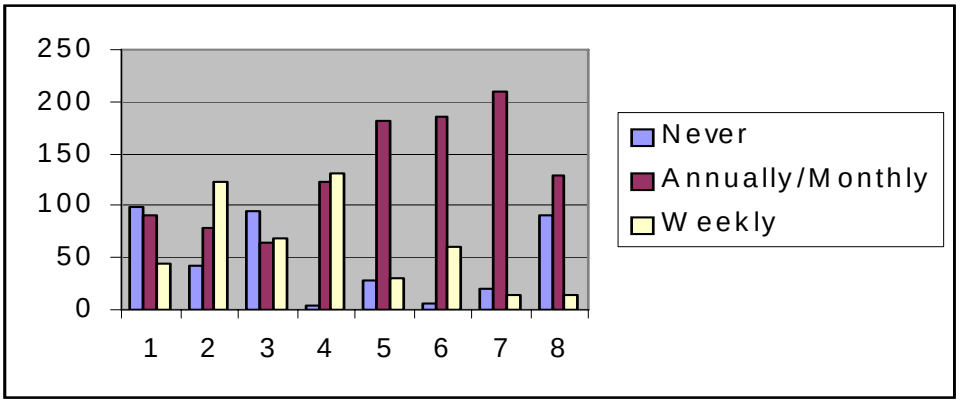

Figure 5.3a

The breakdown of use of electronic and traditional facilities by economists

1=University library web site 2=Other web sites 3=Bulletin boards 4=University library 5=Other libraries 6=Bookshops 7=Publishers catalogues 8=Colleagues archives

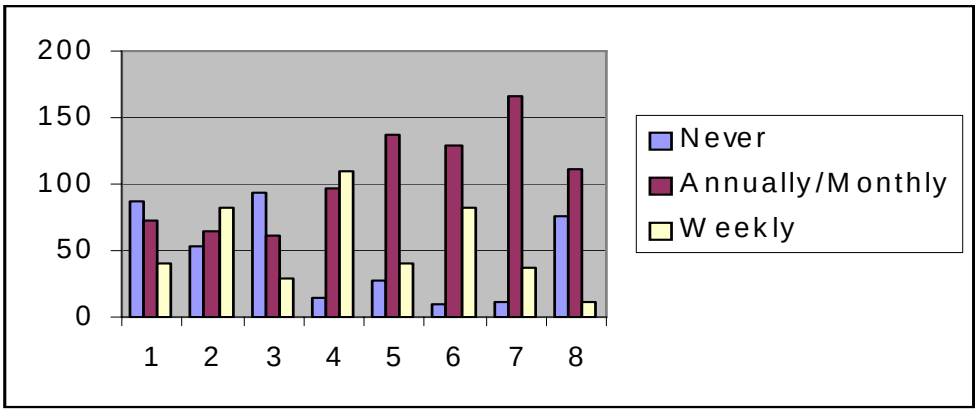

Figure 5.3b

The breakdown of use of electronic and traditional facilities by sociologists

1=University library web site 2=Other web sites 3=Bulletin boards 4=University library 5=Other libraries 6=Bookshops 7=Publishers catalogues 8=Colleagues archives

Chi-squared tests were applied to all categories of traditional and electronic facilities in terms of the two categories of communities studied. Out of eight categories of facilities, three correlated significantly with type of community. They are other web sites, bulletin boards, and publishers' catalogues, which correlated at the 0.01 level of confidence. Other web sites and bulletin boards were more used by economists, whereas publishers' catalogues were more used by sociologists.

5.4.3 The use of electronic and traditional information sources

A selected list of nine traditional (printed) and electronic sources was presented to the respondents in order to measure their average use. Table 5.12 summarises the results for the use by the whole population and underlines the fact that printed sources are the most used information sources by the two communities.

Table 5.12

The breakdown of use of information sources by the whole population

Sources	**Never**		**Annually / Monthly**		**Weekly**		**Total**
	F	**%**	**F**	**%**	**F**	**%**	
Electronic journals	149	32.0	205	44.1	111	23.9	465
Electronic conference proceedings	211	46.7	217	48.0	24	5.3	452
Full text databases	153	33.3	239	52.1	67	14.6	459
Online numeric databases	196	44.9	189	43.2	52	11.9	437
Printed books	6	1.2	43	8.9	434	89.9	483
Printed journals	5	1.0	65	13.4	415	85.6	485
Printed conference proceedings	13	2.7	286	60.1	177	37.2	476
Technical reports	25	5.3	257	54.5	190	40.2	472
Discussion papers	13	2.7	208	43.6	256	53.7	477

According to the results shown in the table above, the most used information source is the printed journal (99 percent), followed closely by printed books (98.8 percent). Printed conference proceedings and discussion papers presented the same frequency of use (97.3 percent). The least used traditional information source was the technical report (94.7 percent). In terms of frequency of use, printed books, printed journals and

discussion papers are more used on a weekly basis, whereas printed conference proceedings and technical reports are more used on an annual/monthly basis. As regards electronic sources only, the most used one is the electronic journal (68 percent), closely followed by full-text databases (66.7 percent). The least used one is electronic conference proceedings (53.3 percent). All the electronic sources are more used on an annual/monthly basis.

There are, however, differences between the two communities of researchers, as can be observed in Figures 5.4a and 5.4b. Chi-squared tests were applied to all categories of information source against the two categories of communities. Out of nine categories of information sources, three correlated significantly with the type of community. They are electronic conference proceedings, online numeric databases and technical reports, which correlate at the 0.01 level of confidence. In all these categories economists are using the sources more frequently than sociologists.

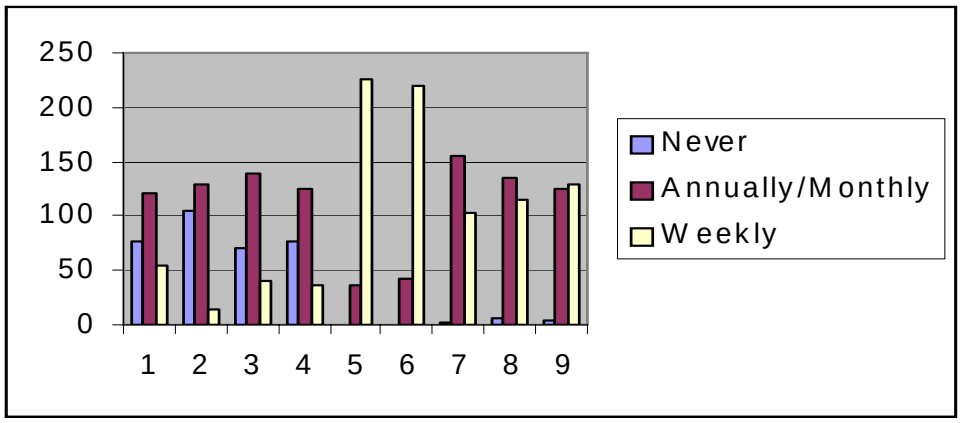

Figure 5.4a

The breakdown of use of electronic and traditional sources by economists

1=E-journals 2=E-conference proceedings 3=Full text databases 4=Numeric databases 5=P-books 6=P-journals 7=P-conference proceedings 8=Technical reports 9=Discussion papers

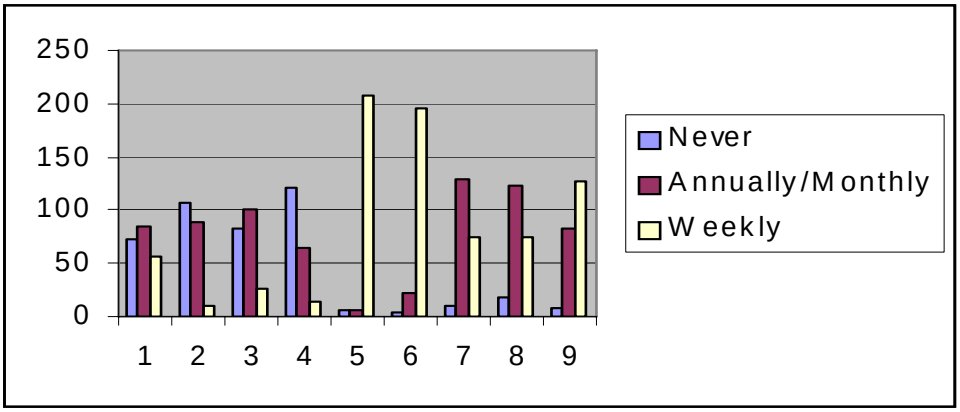

Figure 5.4b

The breakdown of use of electronic and traditional sources by sociologists

1=E-journals 2=E-conference proceedings 3=Full text databases 4=Numeric databases 5=P-books 6=P-journals 7=P-conference proceedings 8=Technical reports 9=Discussion papers

5.4.4 The use of electronic and traditional information services

Table 5.13 presents the data gathered concerning the range of information services used. These show that there is an overall tendency towards not using information services frequently, either electronic or traditional ones, since most of the frequencies are related to annually and monthly use in the two communities studied. Library card catalogues constitute the most used information service by these communities (85.3 percent of the respondents were using them), followed by printed abstracts (83.3 percent of use) and electronic search engines (80.3 percent of use). The least used service was document delivery (43.4 percent never used it), followed by personal card catalogues (42.3 percent 'never used') and CD-ROM databases (41.2 percent 'never used'). In terms of frequency of use, the most frequently (weekly) used information services are personal bibliographic databases and electronic search engines. At the annual/monthly level, the most used services are printed abstracts, interlibrary loans and current contents.

Table 5.13

The breakdown of use of information services by the whole population

Service	Never		Annually / Monthly		Weekly		Total
	F	%	F	%	F	%	
Library OPAC	133	29.3	231	50.9	90	19.8	454
Online bibliographic databases	125	28.0	248	55.6	73	16.4	446
CD-ROM bibliographic databases	186	41.2	228	50.6	37	8.2	451
Electronic search engines	90	19.7	229	50.0	139	30.3	458
Personal bibliographic databases	127	28.7	147	33.3	168	38.0	442
Library card catalogues	69	14.7	280	59.6	121	25.7	470
Personal card catalogues	187	42.3	148	33.5	107	24.2	442
Printed abstracts	75	16.7	291	64.6	84	18.7	450
Current contents	90	20.6	269	61.7	77	17.7	436
Interlibrary loan	140	30.9	280	61.8	33	7.3	453
Document delivery (COMUT)	172	43.4	209	52.8	15	3.8	396

Some differences were identified between the two groups of respondents. Figures 5.5a and 5.5b show the data gathered to measure the use of information services in each community of researchers. Chi-squared tests were applied to all the categories of information services against the two categories of communities. Out of eleven categories of information services, five correlated significantly with the type of community, all of them at the 0.01 level of confidence. They are library card catalogues, personal card catalogues, printed abstracts, current contents and interlibrary loans; all are more frequently used by sociologists than by economists.

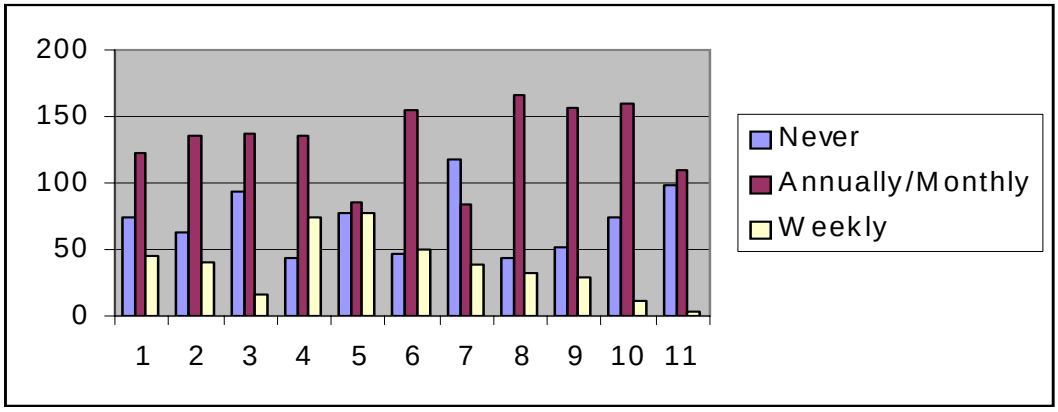

Figure 5.5a

The breakdown of use of electronic and traditional information services by economists

1=Library OPAC 2=Online bibliographic databases 3=CD-ROM databases 4=Electronic search engines 5=Personal bibliographic databases 6=Library Card catalogues 7=Personal card catalogues 8=Printed abstracts 9=Current contents 10=Interlibrary loan 11=Document delivery

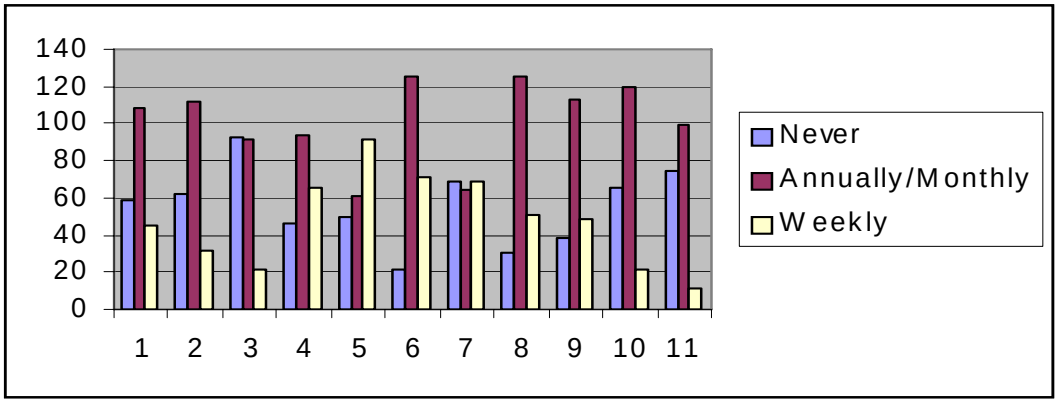

Figure 5.5b

The breakdown of use of electronic and traditional information services by sociologists

1=Library OPAC 2=Online bibliographic databases 3=CD-ROM databases 4=Electronic search engines 5=Personal bibliographic databases 6=Library Card catalogues 7=Personal card catalogues 8=Printed abstracts 9=Current contents 10=Interlibrary loan 11=Document delivery

5.5 Motivation

Question number thirteen was about motivation, which was measured in terms of six categories of factor that may have influenced the researchers' determination to publish over the past five years. Each factor was assigned a priority that ranged from 1 (most important) to 6 (least important). The results are shown in Tables 5.14a and 5.14b and Figures 5.6a and 5.6b. According to the data shown in the tables and figures, self-motivation was by far and away the most important factor driving respondents' desire to publish. The second highest priority was recognition by their peers. CAPES's evaluation was given the lowest priority, closely followed by the university reward system.

By and large, there are no significant differences in the patterns of frequency distribution between the two communities studied. An exception may occur in "involvement in teamwork", where differences between economists and sociologists correlate at the 0.05 level of confidence. Sociologists gave higher priority to this issue than economists did.

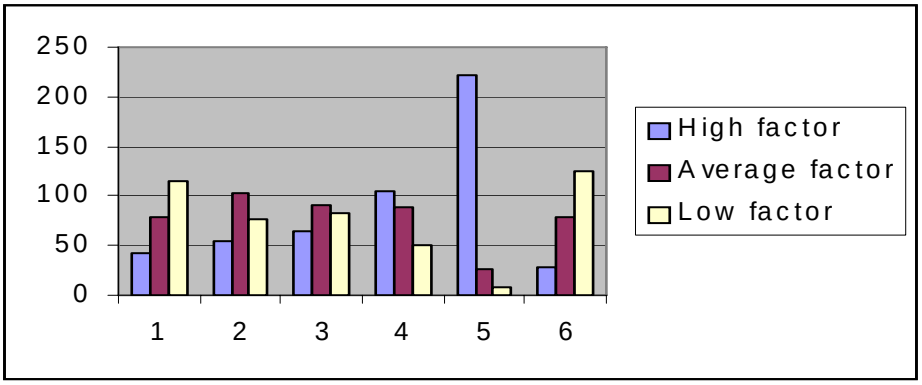

Figure 5.6a

Factors driving the desire for publishing amongst economists

1=The university reward system 2=Desire for research funding 3=Involvement in teamwork 4=Recognition by the community 5=Self-motivation 6=CAPES' evaluation

Table 5.14a

Factors that drive researchers' desire for publishing

Factors	Priority												Total	Mean
	1		2		3		4		5		6			
	F	%	F	%	F	%	F	%	F	%	F	%		
The university reward system	37	18.4	37	8.4	173	16.7	63	14.4	73	16.7	156	35.5	439	4.29
Desire for research funding	34	7.8	62	14.2	94	21.5	106	24.3	90	20.6	50	11.5	436	3.70
Involvement in teamwork	51	11.6	94	21.3	88	20.0	76	17.2	74	16.8	58	13.1	441	3.46
Recognition from peers	60	13.4	127	28.4	102	22.8	67	15.0	50	11.2	41	9.2	447	3.10
Self-motivation	318	66.4	83	17.3	29	6.1	25	5.2	12	2.5	12	2.5	479	1.68
CAPES' evaluation	19	4.3	41	9.4	52	11.9	87	19.9	128	29.3	110	25.2	437	4.36

Table 5.14b
Priorities ranking desire for publishing

Factor	Rank
Self-motivation	**1**
Recognition by peers	**2**
Involvement in teamwork	**3**
Desire for research funding	**4**
The university reward system	**5**
CAPES' evaluation	**6**

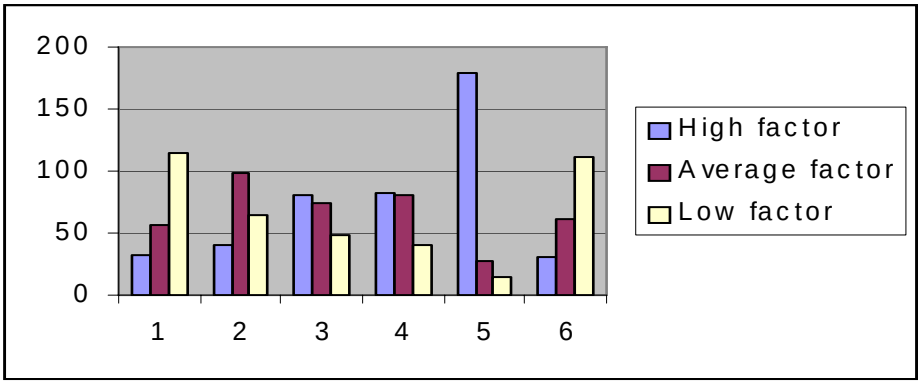

Figure 5.6b

Factors driving the desire for publishing amongst sociologists

1=The university reward system 2=Desire for research funding
3=Involvement in teamwork 4=Recognition by the community
5=Self-motivation 6=CAPES evaluation

5.6 Expectations

Question number 14 of the questionnaire measured expectations relating to the use of computers for research communication. Two groups of expectations were included: first -the respondents' own expectations; second -general expectations.

Table 5.15 presents the data relating to the respondents' own expectations in each community of researchers. To obtain better clarity, the five categories in the questionnaire -namely, strongly agree, agree, not sure, disagree and strongly disagree- were compressed into three -namely, agree, not sure and disagree. Table 5.15 also gives the level of confidence obtained by applying the chi-squared test to all of the statements against the type of community. The results show that the great majority of the respondents in both groups agree that the use of computers helps to:

- Increase informal communication;
- Increase publications;
- Improve the quality of work;
- Widen the scholarly community;

- Produce more work in less time;
- Make it easier to find relevant information for research.

Within both communities, there is no clearly defined position of the respondents for the categories "publishing in electronic journals" and "computers helping to improve creativity". Only about half of the respondents agree with these statements, and around 30 to 40 percent are not sure about them.

In terms of differences between economists and sociologists, some have been found, though there is no statistical significance for the majority of them. Such differences show a slightly higher percentage of economists agreeing with all the statements (except with "publish electronic journal articles") alongside a slightly higher percentage of sociologists disagreeing with all of them. The chi-squared results for these categories show that only two of them correlate with the type of community. These are "increase informal communication" and "improve quality of work", correlating at the 0.05 level of confidence. Although the category "make it easier to find relevant information", also correlates at the 0.05 level of confidence, the result is not valid because there are more than 25 percent of cells counting less than five.

Table 5.15
Respondents own expectations

Own expectations	**No. of cases**		**Agree**		**Not sure**		**Disagree**		**Level of confidence**
	Eco.	**Soc.**	**Eco.**	**Soc.**	**Eco.**	**Soc.**	**Eco.**	**Soc.**	
			%	%	%	%	%	%	
Increase informal communication	259	225	86.9	77.8	10.0	15.6	3.1	6.6	.025
Increase publications	259	225	81.9	76.0	15.1	16.0	3.0	8.0	.050
Improve quality of work	259	225	95.8	89.3	2.3	7.1	1.9	3.6	.020
Publish electronic journal articles	260	225	55.0	57.8	40.0	36.9	5.0	5.3	.781
Widen the scholarly community	259	224	86.1	85.3	11.6	11.2	2.3	3.5	.711
Produce more work in less time	258	225	90.3	84.0	6.6	10.7	3.1	5.3	.114
Improve creativity	257	222	50.2	45.5	32.7	28.4	17.1	26.1	.055
Make it easier to find relevant information	259	224	83.0	68.3	14.7	26.8	2.3	4.9	.016

Eco. = economists
Soc. = sociologists

Table 5.16 shows the data on general expectations relating to the use of computers for research communication purposes, according to the respondents' perceptions. Results

in the table reveal that the majority of the respondents in both communities agree that external individuals and bodies expect the use of electronic communication will:

- Make collaborative work easier;
- Yield new scholarly communities;
- Reduce the time spent in the peer review process;
- Increase the number of research projects concerned with information technology.

An exception is made for the statement relating to governmental/institutional policies, which has a negative connotation, as it states that these policies do not benefit academic researchers in their areas. Economists disagree more with the sentence, whereas sociologists agree. A common point that arose from these general expectations is that, except for the statement "make collaborative work easier", the percentage of agreement is not very high (between 50 and 60 percent) along with a percentage of 'not sure' which ranges between 30 and 40 percent. Chi-squared tests were applied to all categories of general expectations against the type of community. Out of five categories of expectations, four correlate significantly with the type of community. "Reduce time spent in the peer review process" is one of them, which correlates at the 0.05 level of confidence. The other three are "increase the number of research projects concerned with IT", "make collaborative work easier" and "not benefited by governmental and institutional policies". These correlate at the 0.01 level of confidence. Economists indicate a higher level of agreement with the statements related to collaborative work and peer review process. Sociologists agree more with the statements related to increasing the number of research projects concerned with IT and the governmental/institutional policies. In terms of disagreement, sociologists disagree less only with the statement "not benefited by governmental and institutional policies".

Table 5.16

General expectations

General expectations	No. of cases		Agree		Not sure		Disagree		Level of confidence
	Eco.	Soc.	Eco.	Soc.	Eco.	Soc.	Eco.	Soc.	
			%	%	%	%	%	%	
Make collaborative work easier	259	224	83.0	68.3	14.7	26.8	2.3	4.9	.001
Yield new scholarly communities	259	223	60.6	56.1	36.7	39.9	2.7	4.0	.498
Reduce the time spent in the peer review process	259	221	59.1	57.0	39.8	37.6	1.1	5.4	.027
Increase the number of research projects concerned with IT	259	224	55.6	60.3	43.2	34.4	1.2	5.3	.008
Not be benefited by governmental and institutional policies	256	224	28.9	42.4	30.5	31.7	40.6	25.9	.001

In broad terms, economists showed greater expectations than sociologists as regards the use of computers for communicating research. These issues related to expectations are analysed in greater depth via the interview data in the next chapter.

5.7 Some relationships with gender

Chi-squared tests were applied to all variables describing demographic characteristics of the respondents against all categories of both electronic and traditional resources. The main aim was to see whether demographic characteristics have any correlation with the use of information technology. Only gender showed some correlation. Because differences between economists and sociologists constitute the main focus of this investigation, all crosstabulations have been performed for each category of the two communities. The results -discussed below- indicate that gender is related to some categories of resources, either in each community separately or in both of them.

5.7.1 Relationships identified on both communities

In both communities of researchers, gender correlates significantly with two resources only: 'other web sites' and 'colleagues' archives'. It correlates at the 0.01 level of confidence with web sites amongst economists only. The significance amongst sociologists is at the 0.05 level of confidence. As regards colleagues' archives, gender

correlates at the 0.05 level of confidence in both communities. In all correlations males use the resources more than females.

5.7.2 Relationships identified amongst economists

Crosstabulations of gender and the use of the university library found a possible significant correlation. This is at the 0.05 level of confidence amongst economists only, with males using the university library more than females.

5.7.3 Relationships identified amongst sociologists

Gender correlates significantly with a number of resources, both electronic and traditional amongst sociologists. In terms of traditional resources, gender correlates with the frequency of use of two information sources in this community: printed conference proceedings and technical reports. It also correlated with two information services -current contents and library card catalogues. All these four correlations are at the 0.05 level of confidence. As regards electronic resources, gender correlates with the frequency of use of one facility -'bulletin boards'- at the 0.05 level of confidence. It also correlates with the frequency of use of four information services: library OPACs, online bibliographic databases and CD-ROM bibliographic databases, at the 0.05 level of confidence, as well as with electronic search engines, at the 0.01 level of confidence. Finally, gender correlates with the frequency of use of one information source -full text databases- at the 0.01 level of confidence. In all cases, males use the resources more than females.

5.8 The use of information technology

A number of crosstabulations were performed for all categories of electronic resources in terms of equipment, facilities, sources and services. The main aim was to see whether the frequency of use of one resource is related to the frequency of use of electronic resources in general. Chi-squared tests were then applied to all electronic resources against each other and, in a few cases, against some traditional ones. A large number of correlations were identified. Many repetitions occurred and were eliminated. Therefore, the number of correlations presented for each resource decreases as the analysis goes on, in order to avoid too many repetitions.

5.8.1 The use of the university library web site

The majority of the correlations found between the frequency of use of the university library web site and all the electronic resources plus some traditional ones were valid for both communities studied and correlate at the 0.01 level of confidence. However, networked computers on the researchers' desk amongst economists, personal bibliographic databases amongst sociologists, and other libraries amongst economists correlated at the 0.05 level of confidence.

The frequency of use of the university library web site correlated significantly with the frequency of use of the following:

- Electronic equipment: networked computers on the researchers' desks and networked computers somewhere at work.
- Electronic facilities: other web sites and bulletin boards.
- Electronic sources: electronic journals, full text databases and online numeric databases.
- Electronic services: library OPAC, personal bibliographic databases, electronic search engines, CD-ROM bibliographic databases and online bibliographic databases.
- Traditional resources: other libraries.

There were two correlations found for economists only, both of them at the 0.01 level of confidence: with electronic conference proceedings and library card catalogues. Amongst sociologists only, one correlation was identified with the university library, at the 0.01 level of confidence.

There were differences in terms of frequency of use. The highest frequency of use of the university library web site was 'never'. Amongst the resources that appear in the correlation presented here the ones with higher frequency of 'never use' were:

- For both communities: networked computers somewhere at work.
- For sociologists only: networked computers on the researchers' desks and online numeric databases.

Resources used more frequently on an 'annual/monthly' basis were:

- For both communities: electronic journals, full text databases, library OPAC, electronic search engines, CD-ROM bibliographic databases, online bibliographic databases, and other libraries.
- For economists only: online numeric databases, personal bibliographic databases, electronic conference proceedings, and library card catalogues.

Resources used more on a 'weekly' basis were:

- For both communities: other web sites.
- For economists only: networked computers on the researchers' desks.
- For sociologists only: personal bibliographic databases and university library.

5.8.2 The use of other web sites

Most of the correlations found between the frequency of use of other web sites and all other resources were valid for both communities of researchers and correlate at the 0.01 level of confidence. Apart from the correlations previously presented, the frequency of use of other web sites correlated significantly with the frequency of use of the following:

- Electronic equipment: networked computers on the researcher's desk and networked computers somewhere else at work.
- Electronic facilities: bulletin boards.
- Electronic sources: electronic journals, full-text databases and online numeric databases. Correlation with electronic conference proceedings applies only to economists, since there are more than 25% of cells counting less than 5 for sociologists in this case.
- Electronic services: library OPAC, online bibliographic databases, CD-ROM bibliographic databases, electronic search engines and personal bibliographic databases.

Amongst economists only, the frequency of use of other web sites correlated with the frequency of use of the library OPAC at the 0.05 level of confidence. Amongst sociologists, it correlated at the 0.05 level of confidence with the frequency of use of personal bibliographic databases.

Differences in frequency of use were found amongst the resources studied. In both communities, weekly was the highest level of frequent use of other web sites. Amongst the resources that appear in the correlation presented here, the ones with 'never' as the highest frequency of use were:

- For both communities: networked computers somewhere at work and discussion lists.
- For sociologists only: networked computers on the researcher's desk, online numeric databases and CD-ROM bibliographic databases.

Resources with 'annually/monthly' as the highest frequency of use were:

- For both communities: electronic journals, full-text databases, library OPACs, online bibliographic databases and electronic search engines.
- For economists only: electronic conference proceedings, online numeric databases, CD-ROM bibliographic databases and personal bibliographic databases.

Resources with 'weekly' as the highest frequency of use were:

- For economists only: networked computers on the researcher's desk.
- For sociologists only: personal bibliographic databases.

5.8.3 The use of bulletin boards

Apart from the other correlations already presented, most of the results on the frequency of use of bulletin boards were valid for both communities and correlated at the 0.01 level of confidence. The correlations found were the following:

- Electronic equipment: networked computers on the researchers' desks.

- Electronic sources: electronic journals, full text databases and online numeric databases.

- Electronic services: library OPAC, electronic search engines, CD-ROM bibliographic databases and online bibliographic databases. An exception here is the correlation with the library OPAC amongst economists, which correlates at the 0.05 level of confidence.

There was one correlation found that applies to sociologists only. This was with the frequency of use of networked computers somewhere else at work, correlating at the 0.05 level of confidence, with 'never' as the highest frequency of use.

The major frequencies of use vary within the correlation groups. The highest frequency of use of bulletin boards was 'never' for both communities. Amongst the correlations presented here, the resources with 'never' as the highest frequency of use were:

- For sociologists only: networked computers somewhere at work, online numeric databases and CD-ROM bibliographic databases.

Resources with 'annually/monthly' as the highest frequency of use are:

- For both communities: electronic journals, full text databases, library OPAC, electronic search engines, and online bibliographic databases.

- For economists only: online numeric databases and CD-ROM bibliographic databases.

Resources with 'weekly' as the highest frequency of use are:

- For economists only: networked computers on the researchers' desks.

5.8.4 The use of electronic journals

Apart from the other correlations already presented, the majority of the results relating to the frequency of use of electronic journals and the frequency of use of other resources were valid for both the communities studied and correlates at the 0.01 level of confidence. Only one correlated at the 0.05 level of confidence. This was with

library OPACs amongst sociologists. The frequency of use of electronic journals correlated significantly with the following:

- Electronic equipment: networked computers somewhere at work.
- Electronic sources: full text databases and online numeric databases.
- Electronic services: library OPAC, electronic search engines, CD-ROM bibliographic databases and online bibliographic databases.

There was one correlation valid for economists only. This was between electronic journals and electronic conference proceedings, correlating at the 0.01 level of confidence. Amongst sociologists only, three correlations were found: with networked computers on the researchers' desks (0.05 level of confidence), the university library (0.01 level of confidence) and other libraries (0.05 level of confidence).

Differences in frequency of use vary. Annually/monthly was the highest frequency of use of electronic journals. Amongst those resources that appear in the correlation presented here, the ones with highest frequency of 'never use' were:

- For both communities: networked computers somewhere at work.
- For sociologists only: online numeric databases, CD-ROM bibliographic databases and networked computers on the researchers' desks.

Resources with the highest frequency of 'annually/monthly' use were:

- For both communities: full text databases, library OPACs, electronic search engines, and online bibliographic databases;
- For economists only: online numeric databases, CD-ROM bibliographic databases and electronic conference proceedings.
- For sociologists only: other libraries.

Resources that have been used more on a 'weekly' basis were:

- For both communities: electronic journals and other web sites;
- For sociologists only: university library.

5.8.5 The use of electronic conference proceedings

A number of correlations were found between the frequency of use of electronic conference proceedings and all other resources. However, some of them were not valid because there were more than 25% of cells counting less than 5. Amongst those which remained valid, and apart from those already presented with previous resources, the majority correlated at the 0.01 level of confidence. They were:

- Electronic equipment: networked computers at home for economists only at the 0.01 level of confidence.
- Electronic sources: online numeric databases for both communities at the 0.01 level of confidence.
- Electronic services: library OPACs for both communities, at the 0.01 level of confidence. CD-ROM bibliographic databases, electronic search engines and personal bibliographic databases for economists only, also at the 0.01 level of confidence.

There were differences in frequency of use. The highest frequency of use of electronic conference proceedings was 'annually/monthly' amongst economists and 'never' amongst sociologists. Amongst the resources which appeared in these correlations, those with 'never' as the highest frequency of use were:

- For economists only: networked computers at home.
- For sociologists only: online numeric databases.

Resources with 'annually/monthly' as the highest frequency of use were:

- For both communities: library OPACs.
- For economists only: full-text databases, online numeric databases, online bibliographic databases, CD-ROM bibliographic databases, electronic search engines and personal bibliographic databases.

There were no resources with a 'weekly' frequency of use in this case.

5.8.6 The use of full-text databases

Apart from the correlations already presented here, the majority of the correlations found between the frequency of use of full-text databases and the frequency of use of all other resources were valid for both communities and correlated at the 0.01 level of confidence. They were:

- Electronic equipment: networked computers on the researcher's desk and networked computers somewhere at work at the 0.01 level of confidence amongst economists and at the 0.05 level amongst sociologists.
- Electronic sources: online numeric databases.
- Electronic services: library OPACs, online bibliographic databases, CD-ROM bibliographic databases, electronic search engines and personal bibliographic databases.

Differences in terms of frequency of use were identified. The highest frequency of use of full-text databases was annually/monthly for both communities. Amongst those resources that appear in these correlations, the ones with 'never' as the highest frequency of use were:

- For both communities: networked computers somewhere at work.
- For sociologists only: networked computers on the researcher's desk and online numeric databases.

Resources with 'annually/monthly' as the highest frequency of use were:

- For both communities: library OPAC, online bibliographic databases, CD-ROM bibliographic databases ad electronic search engines.
- For economists only: online numeric databases and personal bibliographic databases.

Weekly is the highest frequency of use of the following resources:

- For economists only: networked computers on the researcher's desk.
- For sociologists only: personal bibliographic databases.

5.8.7 The use of online numeric databases

Apart from the correlations previously presented, the majority of the correlations found between the frequency of use of online numeric databases and the frequency of use of other electronic resources were valid for both communities and correlated at the 0.01 level of confidence. They were:

- Electronic equipment: networked computers on the researcher's desks.
- Electronic sources: library OPAC, online bibliographic databases, CD-ROM bibliographic databases, electronic search engines and personal bibliographic databases.

Frequency of use showed differences. The highest frequency of use of online numeric databases was annually/monthly for economists and never for sociologists. Amongst the resources which appear in these correlations, those with 'never' as the highest frequency of use were:

- For economists only: networked computers somewhere at work.
- For sociologists only: networked computers on the researcher's desk and CD-ROM bibliographic databases.

Resources with 'annually/monthly' as the highest frequency of use were:

- For both communities: library OPAC, online numeric databases and electronic search engines.
- For economists only: CD-ROM bibliographic databases and personal bibliographic databases.

Resources with 'weekly' as the highest frequency of use were:

- For economists only: networked computers on the researcher's desk.
- For sociologists only: personal bibliographic databases.

5.8.8 The use of library OPACs

Apart from previous correlation already presented for the frequency of use of library OPACs, the majority of the ones found correlated at the 0.01 level of confidence for both communities. They were:

- Electronic equipment: networked computer somewhere at work at the 0.05 level of confidence for both communities.
- Electronic services: online bibliographic databases, CD-ROM bibliographic databases, electronic search engines and personal bibliographic databases.
- Traditional resources: library card catalogues, at the 0.01 level of confidence for both communities.

Differences in relation to frequency of use were found. The highest frequency of use of library OPACs was annually/monthly for both communities. In terms of other resources, the ones that appear in these correlations and have 'never' as the highest frequency of use were:

- For both communities: networked computers somewhere at work.
- For sociologists only: CD-ROM bibliographic databases.

Resources with 'annually/monthly' as the highest frequency of use were:

- For both communities: online bibliographic databases, electronic search engines and library card catalogues.
- For economists only: CD-ROM bibliographic databases and personal bibliographic databases.

Resources with 'weekly' as the highest frequency of use were:

- For sociologists only: personal bibliographic databases.

5.8.9 The use of online bibliographic databases

Apart from the previously presented correlations, most of the correlations found between the frequency of use of online bibliographic databases and the frequency of

use of other electronic resources were valid for both communities, and correlated at the 0.01 level of confidence. They were:

- Electronic equipment: networked computers on the researchers desk, at the 0.01 level of confidence amongst economists and the 0.05 level amongst sociologists, and networked computers somewhere at work, at 0.01 level of confidence for both communities.

- Electronic services: CD-ROM bibliographic databases, electronic search engines and personal bibliographic databases.

There were differences in frequency of use of the resources that appear in these correlations. Annually/monthly was the highest frequency of use of online bibliographic databases for both communities. Resources with 'never' as the highest frequency of use were:

- For both communities: networked computers somewhere at work
- For sociologists only: networked computers on the researcher's desk and CD-ROM bibliographic databases.

Resources with 'annually/monthly' as the highest frequency of use are:

- For both communities: electronic search engines,
- For economists only: CD-ROM bibliographic databases and personal bibliographic databases.

Resources with 'weekly' as the highest frequency of use are:

- For economists only: networked computers on the researcher's desk.
- For sociologists only: personal bibliographic databases.

5.8.10 The use of CD-ROM bibliographic databases

Apart from the previously presented correlations, some more correlations were found between CD-ROM bibliographic databases and other resources. They were:

- Electronic equipment: networked computers at home for economists only at the 0.05 level of confidence. For both communities, it correlated with networked computers on the researcher's desk (for economists at the 0.05 of confidence and for sociologists at the 0.01) and networked computers somewhere at work at the 0.01 level of confidence.

- Electronic services: electronic search engines and personal bibliographic databases for both communities at the 0.01 level of confidence.

Differences were found in terms of frequency of use. The highest frequency of use of CD-ROM bibliographic databases was annually/monthly for economists and never for sociologists. Amongst the resources that appear in the correlation presented here, the ones with 'never' as the highest frequency of use were:

- For both communities: networked computers somewhere at work.
- For economists only: networked computers at home
- For sociologists only: networked computers on the researcher's desk.

Resources with 'annually/monthly' as the highest frequency of use were:

- For both communities: electronic search engines.
- For economists only: personal bibliographic databases.

Resources with 'weekly' as the highest frequency of use were:

- For economists only: networked computers on the researcher's desk.
- For sociologists only: personal bibliographic databases.

5.8.11 The use of electronic search engines

Apart from the previous correlations presented, a number of other correlations between the frequency of use of electronic search engines and the frequency of use of other electronic resources were found. They were:

- Electronic equipment: networked computers on the researcher's desk for both communities at the 0.01 level of confidence. Networked computers somewhere at work correlates at the 0.01 level of confidence for sociologists only.
- Electronic services: personal bibliographic databases at the 0.01 level of confidence for both communities.

There were differences in terms of frequency of use for each resource. The most frequency of use of electronic search engines was annually/monthly for both communities. Amongst the resources that appeared in these correlation, the ones with 'never' as the highest frequency of use were:

- For both communities: networked computers somewhere at work.
- For sociologists only: networked computers on the researcher's desk.

Resources with 'annually/monthly' as the highest frequency of use were:

- For economists only: personal bibliographic databases

Resources with 'weekly' as the highest frequency of use were:

- For economists only: networked computers on the researcher's desk.
- For sociologists only: personal bibliographic databases.

5.8.12 The use of personal bibliographic databases

All the correlations between the use of personal bibliographic databases have already been presented via the previous correlations above. Any inclusion here would represent repetition.

5.9 Experience with computers

Experience with computers relates to the number of years respondents had used computers for communication purposes. This variable was checked against all categories of electronic resources, as well as the demographic variables and mobility, both intellectual and physical. All the crosstabulations were performed for each community of researchers.

5.9.1 Equipment

In terms of electronic equipment, the number of years using computers correlated significantly with the frequency of use of:

- Stand alone computers at home, for both communities at the 0.01 level of confidence.
- Networked computer at home for economists only, at the 0.01 level of confidence.
- Stand alone computers at work for both communities at the 0.01 level of confidence.
- Networked computers on the researchers' desks for economists at the 0.01 level of confidence and for sociologists at the 0.05 level.
- Networked computers somewhere else at work for economists at the 0.01 level of confidence and for sociologists at the 0.05 level.

5.9.2 Facilities

In terms of facilities, the number of years of using computers correlated significantly with the frequency of use of the following resources:

- Other web sites, for both communities at the 0.01 level of confidence.
- Bulletin boards for sociologists only at the 0.05 level of confidence.

5.9.3 Sources

As regards information sources, the number of years of using computers correlated significantly with the frequency of use of the following resources:

- Electronic journals for sociologists only at the 0.05 level of confidence.
- Full text databases for sociologists at the 0.05 level of confidence and for economists at the 0.01 level.
- Electronic conference proceedings for economists only at the 0.05 level of confidence.
- Online numeric databases for economists only at the 0.01 level of confidence.

5.9.4 Services

As regards electronic services, the number of years of using computers correlated significantly with the frequency of use of the following resources:

- Library OPAC for sociologists only at the 0.05 level of confidence.
- Online bibliographic databases for both communities at the 0.05 level of confidence.
- CD-ROM bibliographic databases for both communities at the 0.05 level of confidence.
- Electronic search engines for sociologists only at the 0.01 level of confidence.
- Personal bibliographic databases for sociologists only at the 0.05 level of confidence.

In terms of frequency of use, resources with higher frequency of 'never' use were:

- For both communities: networked computers at home and networked computers somewhere at work.
- For sociologists only: networked computers on the researchers' desks and bulletin boards.

Resources with the highest frequency of using on an 'annual/monthly basis were:

- For both communities: full text databases, online bibliographic databases and CD-ROM bibliographic databases.
- For economists only: electronic conference proceedings and online numeric databases.
- For sociologists only: electronic journals, library OPAC, and electronic search engines.

Resources with the highest use on a 'weekly' basis were:

- For both communities: stand-alone computers at home, stand-alone computers at work and other web sites.
- For economists only: networked computers on the researchers' desks.

♦ For sociologists only: personal bibliographic databases.

No correlations were found between the number of years of using computers and the demographic variables. In relation to mobility, a correlation was found with the number of years working in the same specialism, for both communities at the 0.05 level of confidence.

5.10 Comments from the respondents

Questions about the average use of information sources and information services offered respondents the option to suggest any item that might eventually be relevant and had not been included amongst the previous options. Very few respondents (eleven economists and fifteen sociologists) added information sources different from those already included in the questionnaire. They mentioned theses, newspapers and magazines, fieldwork diaries, research projects, downloaded files, e-mails, statistical yearbooks, videos, governmental papers and papers on diskettes. Differences were identified between economists and sociologists amongst these additional sources. For example, theses, e-mails, videos, fieldwork diaries, research projects and governmental papers were only added by sociologists, whereas newspapers and magazines, statistical yearbooks and downloaded files were only added by economists. Papers on diskettes constituted the only source added by researchers from both communities. None of the respondents added any information service.

CHAPTER SIX

DATA ANALYSIS: INTERVIEWS

6.1 Introduction

The interview method for gathering data constituted the second stage of this investigation. The scope of the interview survey was a small sample of the total population of researchers from post-graduate programmes in economics and sociology in Brazil along with researchers from one university in the UK, as described in the methodology chapter. A total of forty-seven interviews were carried out covering thirty-six researchers from Brazil and eleven from the UK. Of these forty-seven researchers, twenty-three were economists and twenty-four sociologists. In terms of gender, the sample includes thirty males and seventeen females. A better view of these data is presented in Table 6.1 below. Most of the interviewees were in the age range 40-60 years old.

Table 6.1

Number of interviewees by area and gender in Brazil and the UK

Gender	Brazil		UK		Total
	Economists	Sociologists	Economists	Sociologists	
Male	13	09	05	03	**30**
Female	03	11	02	01	**17**
Total	**16**	**20**	**07**	**04**	**47**

The interviews were semi-structured. Figure 6.1 presents a list of the questions asked, to aid discussion of the results in this chapter. Some follow-up questions were posed at the interviews, when appropriate. As semi-structured questions were adopted in the

interviews, the responses included a variety of comments, opinions, examples, etc. The analysis began with the transcription of the interviews. As observed by Kvale, "transcribing is a beginning analysis".[1]

1. *Do your colleagues expect you to use e-mail or discussion lists to discuss with them about your research?*
2. *Do they expect you to read electronic journals or other electronic formal sources? When are those sources going to be as acceptable as the printed ones?*
3. *Is your scholarly community changing because of the use of IT for communication purposes?*
4. *Are financial issues likely to affect the use of IT for communication? Example?*
5. *Have you any knowledge of information policies at your university or in the government plans that might affect the use of IT for communicating research within your field?*
6. *In your opinion, can the use of IT for communicating research become a substitute for any print-related information resources or would it become a complement for them? Such a use can help inadequacies of the printed system? How you see this question now and in a near future?*
7. *Would you agree that the use of IT could help either increase or improve your own publications? Are there changes related to collaborative work?*
8. *Do you think that the use of IT might have an effect on your creativity?*
9. *Do you think that the availability of IT makes any difference to your willingness to communicate?*

Figure 6.1
List of interview questions

The transcription of the Brazilian interviews was made in two steps. The first one consisted of translating from Portuguese to English while typing. It was a very time-consuming task, especially because of the decision to keep verbatim at this stage as much as possible, in order to avoid modifying the meanings while translating from one idiom to another. The second step consisted of a careful review of the English output. At this stage, a little rephrasing was introduced to make the discourse flow more straightforwardly. This procedure of rephrasing was also used with the British

interviews. Both outcomes consisted of a list of questions and answers, the latter being rephrased texts that constitute the material for this analysis.

The main aim of the data analysis is to test the implications of the theory embedded in the research model, as described in the methodology chapter. It was decided to use the condensation approach described by Kvale,[(2)] with some adaptations. The condensation was performed in three main steps, described below.

- Step 1: the text of each response to all questions, except question seven, was compressed into dichotomous categories. The aim was to allow a semi-quantitative view of the responses so as to identify possible patterns that could lead to comparisons between the two communities of respondents in the two countries. Answers to questions one to five and questions eight and nine were compressed into a 'Yes' or 'No' response. Answers to question six were compressed into 'Substitute' or 'Complement' response. Finally, answers to question seven were first sub-divided into 'Both', 'Improve' and 'Increase' options, and then compressed into a 'Yes' or 'No' response. The results of these procedures are shown in Figures 6.2a and 6.2b.

- Step 2: the compressed responses were expanded to allow their qualitative development, by identifying sentences in the interview text that could give meaning to them. These sentences were selected and summarised in the analysis here. The analysis was then extended to cover supplementary questions. Besides allowing identification of the main intentions of the responses to the questions asked, this procedure also allowed identification of both the central theme and complementary topics suggested by the interviewees for each question.

- Step 3: a selection of core and typical sentences was applied in order for them to be used as quotations. The aim was to better illustrate the range of responses to each question.

Control procedures for keeping data standardisation consisted of discussing with my supervisor the interview contents that came out after transcribing them, and subjecting them to the procedure outlined above.

6.2 Quantitative results of the interviews: compressed data

Question No.:		Sociologists (20)	Economists (16)
1	Yes	17	13
	No	2	2
	Don't know	1	1
2	Yes	7	11
	No	11	5
	Don't know	2	0
3	Yes	17	13
	No	2	2
	Don't know	1	1
4	Yes	16	13
	No	4	2
	Don't know	0	1
5	Yes	18	16
	No	2	0
6	Substitute	5	7
	Complement	15	9
7	Both – Yes	17	12
	Both – No	0	0
	Increase – Yes	1	0
	Increase – No	0	2
	Improve – Yes	2	4
	Improve – No	1	0
8	Yes	8	13
	No	12	3
9	Yes	17	13
	No	3	3

Figure 6.2a

Quantitative results of the Brazilian interviews

Question No.:		Sociologists (04)	Economists (07)
1	Yes	3	7
	No	1	0
2	Yes	0	1
	No	3	4
	Don't know	1	2
3	Yes	2	4
	No	1	2
	Don't know	1	1
4	Yes	3	5
	No	0	2
	Don't know	1	0
5	Yes	2	3
	No	2	3
	Don’t know	0	1
6	Substitute	0	2
	Complement	3	4
	Don’t' know	1	1
7	Both – Yes	0	3
	Both – No	1	0
	Both – Don’t know	0	2
	Increase – Yes	0	0
	Increase – No	1	1
	Improve – Yes	3	2
	Improve – No	0	0
8	Yes	2	5
	No	2	2
9	Yes	3	4
	No	1	2
	Don't know	0	1

Figure 6.2b

Quantitative results of the British interviews

The quantitative picture depicted in Figures 6.2a and 6.2b does not indicate major differences in the researchers' perceptions between the two communities studied in either country, for the majority of the questions. Nonetheless, responses to question six, which is concerned with the likelihood of the electronic media either complementing or substituting the printed one, showed differences between the economists and sociologists. Some differences also appear to exist for question two, relating to the use of electronic formal sources, and question eight, about the impact of IT use on creativity. The in-depth qualitative analysis allows these issues to be explored further.

The qualitative analysis presented in this chapter describes the interviewees' perceptions of the problem under investigation and is concerned with three main topics. Firstly, the description includes the researchers' perceptions of social, economic and political pressures upon them. Secondly, their view of the issues regarding the relationship involving electronic versus printed media is elicited. Finally, the impact of computer usage on researchers' productivity, creativity and motivation is analysed from their own point of view.

6.3 Social pressures

Social pressures are analysed in terms of the expectations of the scholarly community with regard to the use of electronic media for informal and formal communication. They are also described in terms of the changes that are perceived by the researchers in their scholarly community itself.

6.3.1 Expectations for informal communication

Informal communication is related particularly to the use of e-mail and discussion lists for communicating research. Researchers were asked whether their colleagues expected them to use these channels for research communication purposes. The majority of the interviewees both in Brazil and the UK answered positively to the question about the expectations of their colleagues for them to use e-mail, but they do not feel pressured to use discussion lists in either country. A number of comments

were made about the pressures they do feel in terms of expectations from colleagues. Illustrative comments are:

> 'There is an increasing expectation. The use of e-mail has become indispensable and now it is impossible to be without it." (Sociologist, BR)

> "There is a great expectation in relation to this. In all contacts that we establish nowadays the questions about what is your e-mail address, what is the possibility of establishing an electronic contact with you, are recurrent." (Sociologist, BR)

> "My colleagues have all sorts of expectations. Today if we do not use this kind of communication media we feel ourselves to be an outsider in the scholarly community." (Economist, BR)

> "There certainly is an expectation from my colleagues. Actually, the only colleague I have working in my topic is in Canada. So, if we do not use e-mail we do not communicate. I perceive quite a lot of people communicating with each other via e-mail and expecting us to do the same." (Economist, UK)

> "There is an increasing desire now to communicate electronically. And it is encouraging. I would say definitely that there are more and more people expecting me and my colleagues to communicate electronically." (Economist, UK)

> "Colleagues within the department, outside the department and outside the university both use and expect me to use e-mail. Discussion lists, I subscribe to a few but nobody would expect me to be part of them." (Sociologist, UK)

A few researchers do not feel pressured to use e-mail, though they are using it. An example that illustrates this opinion is:

> "Expectation, no. We use it, it is increasing, but it is not something that people expect. To communicate, to put up papers, yes, but not for discussion." (Economist, BR)

Besides reporting the expectations of colleagues, most of the interviewees came up with comments about the actual use that they have made of electronic communication. A frequent use of e-mail was reported by the majority of the researchers who employ it. The main use has been to communicate with colleagues at the local, national and international level. Typical comments are:

> "Most of the contact I have within the department is on e-mail. Besides that, as a lot of my research is outside the university both within the UK and outside the UK, I have to use e-mail. It saves our telephone bill." (Economist, UK)

> "I use e-mail to contact colleagues within the department, colleagues within Britain, and also for international communication." (Sociologist, UK)

> "I started using e-mail to communicate more with people abroad than here in Brazil but now I use it even for local communication." (Sociologist, BR)

Alongside the reported use, a range of purposes for such use was also mentioned, the most common one being to exchange research information. Purposes reported include: to receive and submit papers, to exchange bibliographies, to carry out collaborative work, to organise events, to communicate with supervisees, and for informal discussion. For example,

> "I have contact with people from many other Brazilian universities and we frequently exchange bibliographical references and papers via e-mail." (Sociologist, BR)

> "I have been using e-mail a lot for information exchange, file exchange, etc. I am working on a book chapter together with a colleague and we frequently exchange information via e-mail. I have been using it a lot." (Economist, BR)

> "I was forced to use e-mail because I work with colleagues who are in other cities. So, I communicate with them about research issues and in order to write papers in collaboration. I have been using it for

> administrative issues, to organise events, meetings, etc., as well. I also communicate with students. I have, for example, a supervisee who is in Princeton, in the US, and e-mail has been fundamental." (Economist, BR)

> "We have a research group in Latin America and one of our communication media is electronic. Recently I organised a Latin American congress for which I basically used electronic media for dissemination. All the interchange was made via electronic media." (Sociologist, BR)

> "I am in a research team with four members. Now all of the members are on e-mail and we use it in two ways. Firstly, we use e-mail to actually communicate a message. Secondly, we use it as a carrier, to transport documents." (Economist, UK)

One final aspect of the use of e-mail was highlighted, especially by the Brazilian researchers. It has been said that this use has been both at the university and at home, though there seems to be a higher use at the university. However, some interviewees have pointed out that they have been using electronic communication from home, rather than from the university. The main reason given in these cases is because the private providers to whom they subscribe offer better access than universities do. There was no evidence of using computers from home by the British interviewees. Illustrative comments are:

> "As a university lecturer, I first had access to this technology thanks to the university, which provided it for me. However, as it is not so efficient, and sometimes does not work properly, I subscribed to a private provider at home. So, now I use both." (Sociologist, BR)

> "I use an expensive private telephone line at home. Although there are free lines available from universities, they are bad. The private one that I use works very well. My colleagues who use it from the university have disadvantages." (Economist, BR)

A few interviewees both in Brazil and the UK commented about their use of the Internet to search for information for their research. The comments included:

> "I am working on a research project and most of the literature search I do on the Internet. I access our local library from my office and I also search remote libraries through the net. All general search is actually done through the Internet." (Economist, UK)

> "In the most recent projects in which I am involved, I have searched for information on the Internet and it is fantastic, yet frightening. The amount of information is so large that you cannot digest everything that is available." (Economist, BR)

> "I am always using the Internet to search for information related to themes that I am interested in." (Sociologist, BR)

6.3.2 Expectations for formal communication

Formal communication was defined in the interview as the use of electronic journals, or any other formal electronic information source, for communicating research. The question posed to the researchers was whether their colleagues expect them to use these sources. Some differences appear in the answers to this question between economists and sociologists in both countries. In quantitative terms, there are more economists in Brazil agreeing that there is an expectation for them to use electronic formal sources, especially electronic journals, than sociologists. In the UK, only one economist and no sociologists agreed with this question. In qualitative terms, however, those in Brazil who agreed, in both communities, have made similar comments. Some quotations were selected to illustrate both the agreement and disagreement to this matter. Amongst those who feel pressured, it was said that:

> "I feel that there are expectations in relation to electronic journals, though they are less than in relation to informal communication. It has become very common to use electronic media to know about journal contents and see the abstracts, as well as to obtain entire articles in electronic format." (Economist, BR)

> "It is a general expectation. I would say that it is an expressed expectation, a requirement. I think there is an expectation in the

> scholarly community that we should use it more and more." (Economist, BR)
>
> "There is this kind of expectation for me to use electronic formal sources but in practice I still use more printed sources." (Sociologist, BR)

Amongst those who do not feel pressured, the quotations selected state that:

> "Although purely electronic journals already exist, it is not yet entirely disseminated, at least in economics. There are many people still using paper. My colleagues expect me to read and follow up the printed literature." (Economist, BR)
>
> "I do not feel any manifestation in terms of expectations themselves. Comments on this matter have not been made to me. It is something that you can feel but is not yet well established" (Sociologist, BR)
>
> "My colleagues do not expect me to use electronic journals, logically because there are not a lot of social science journals which are relevant to me in electronic format." (Sociologist, UK)

Some researchers from both communities in both countries have reported that they are actually using electronic formal sources, though not very frequently. Amongst those who do not feel any expectation from their colleagues, some are still using them a little. Use of various information sources has been reported, such as electronic books, electronic journals and other serials, electronic conference proceedings, and electronic numeric databases. Some quotations that illustrate these points are:

> "I do use electronic journals sometimes, but I find them finally infuriating. The difficulty with using electronic journals is that there are not many social science ones online." (Sociologist, UK)
>
> "I have used electronic journals but my experience with them is still very little." (Economist, UK)

> "Electronic formal sources are something that has begun to be disseminated. Many annual proceedings are already in CD-ROM format and are being used in this form." (Economist, BR)

> "I am always searching the Internet to seek journal articles related to themes that I am interested in. It is something that I have cited in my articles. I have also retrieved a book, and I have been retrieving journal articles frequently." (Sociologist, BR)

> " I do not use electronic journals so frequently, but electronic serials, which are more informative, I have used a lot. I subscribe to them and receive them. We have here in Brazil some initial projects funded by the government. There is one electronic journal in social sciences in the project SCIELO*, held by BIREME†, in São Paulo, that we access and use." (Sociologist, BR)

Another issue brought up by the interviewees during the discussion of this question relates to publishing their work in electronic format. Some experiences were reported which are quoted below.

> "One of the articles I have recently written was published in electronic form, but I did not send the article to the journal because of that. They also have paper format." (Economist, UK)

> "I see electronic journals as a novelty, actually. I recently have produced a first electronic publication on CD-ROM, but I still feel that it is crawling at the moment." (Sociologist, BR)

> "I believe we are going to use electronic media more and more. I am going to put all the works from the Latin American Association of Communication Researchers on the Internet. It facilitates and expands access." (Sociologist, BR)

* Scientific Electronic Library Online
† Latin America and Caribbean Centre on Health Science Information / Pan American Health Organisation / World Health Organisation.

6.3.3 Changes in the interactions within the scholarly community

Researchers were asked whether there have been changes in their scholarly community itself because of the use of IT for communication purposes. The majority of the interviewees agreed that the scholarly community is changing and a variety of changes were reported. Nevertheless, two issues have emerged from this question as the most pervasive ones. The first one concerns changes in interactivity within the scholarly community. The second one relates to changes in the community boundaries. These issues are commented on below.

Interactivity within the community

Firstly, the issue of the dynamics of interactions within the community emerged as one of the main areas of change. In this regard, it was observed that there have been important changes because this sort of communication has broadened both the contacts and the interactions. As a consequence, interactivity increases, and the researcher's visibility within the scholarly community also increases. It was pointed out that contacts that have been made via the electronic network have become more frequent, bringing about more dynamism because communication is easier and quicker, and the relationship can be more immediate and intensive. Some quotations that illustrate these points are:

> "There is a change in the sense that there is a greater interaction. This information network has facilitated the exchange a lot. Particularly over the last five years this situation has changed radically. It has created dynamism. It has changed a lot, in a positive way." (Sociologist, BR)

> "We clearly feel the change, not only in the inter-relationship between my colleagues and myself, but also a change in the reactions and dynamics. There is a broadening process that does not stay restricted to those who made contact first. A network is established, or it already exists, and people start participating and representing their programmes or institutions via that network." (Sociologist, BR)

> "There have been many changes. Inter-institutional projects have increased because of the facility to exchange papers and information." (Economist, BR)

> "I think there certainly is a change in the scholarly community, mainly in relation to interactivity. Our relationship with international environmental sociology, particularly American environmental sociology, is only possible in a recurrent way due to the use of e-mail. At the same time, the penetration of this international debate in Brazil only occurred because we communicate via the Internet. The personal interchange (people coming and going) has always happened, but rapid information access is only possible via e-mail and the Internet as a whole." (Sociologist, BR)

There are however a few researchers who do not see any change:

> "I do not feel too many changes. Whether it is changing rapidly or not is relative to the type of work we are doing. I still prefer to build up a social atmosphere around the research and actually talk and go to lunch with people I am working with." (Economist, UK)

> "I do not think the community is changing. It is something that I would like to see being studied. Research interaction is different. After making contact in congresses, conferences, etc., we establish communication. Electronic communication happens if a previous relationship already exists." (Economist, BR)

The community boundaries

The broadening of the community boundary was another issue that emerged from the interviewees' perceptions. It is considered that, because of the use of IT for communication purposes, the community has enlarged and accumulated knowledge has become better disseminated. Comprehensiveness, therefore, has increased, because there is a greater number of people with whom one can make contact and distances have been reduced. The ability to contact colleagues easily and quickly, wherever they are, is one of the most important changes reported. It has become possible to contact people who may never be met and it facilitates information

exchange. It also facilitates working collaboratively with people who are geographically distant, and gives a new speed to discussion. Comments referring to these perceptions include:

> "Over the last five years I would say there has been quite a sharp growth in communication world-wide. It is the same kind of interaction but is now at long distance." (Economist, UK)

> "The scholarly community has become much broader because I can contact my colleagues directly and quickly in any part of the world." (Economist, BR)

> "The scholarly community has become much broader because access has become more democratic. Information circulation has become much easier, especially for international information. The Internet is the great change factor. It has modified the way the community interacts without doubt, and has also reduced the geographical distances." (Economist, BR)

> "The scholarly community is becoming wider. It is expanding the network of those with whom we are involved because it is much easier to spread and process information." (Sociologist, UK)

6.4 Economic pressures

Economic pressures are analysed here in terms of financial issues that can either constrain or encourage the use of IT for research communication purposes. The interviewees were asked whether financial issues were likely to affect their use of IT for research communication. The great majority of the interviewees, both in Brazil and the UK, agreed that there are financial issues that can affect the use of IT for communicating research. Differences in responses are mainly related to the origin of the funding needed to support the necessary technology infrastructure. Such money can be provided by the individuals themselves, by the university as an internal body in the academic environment, and by funding agencies as external bodies.

In terms of expenditure by individuals, there are different points of view. It was seen both as a constraint and an encouraging factor, though the former viewpoint was more

pervasive. In terms of money from the university and funding agencies, financial issues appeared as an encouraging factor in the sense that equipment is available for researchers because there has been money to afford it. The pressure in this case comes from the fact that, if both the government and universities provide money for equipment, researchers feel they are expected to use it. In relation to the financial issues in general, it has been said, for example, that:

> "I did not feel any sort of restriction. There is a positive change mainly because of the cost reduction in equipment. You buy more sophisticated equipment at lower prices than used to be possible in the past. In this sense, financial issues have had a positive impact on access to new technologies." (Economist, BR)

> " At the moment, we do not see many of the financial constraints that we had before because the network is free. So, we do not feel the pain to communicate if we do it via the Internet. There are, however, financial data that we pay a lot of money to use. The expenditure between us (the Social Science Department) and the Business School here at the university is about nine thousand pounds a year." (Economist, UK)

6.4.1 Funding by individuals

In individual terms, there were some differences in responses. A few interviewees said that some researchers have equipped themselves because this technology is entirely affordable. Others said that researchers who dedicate themselves entirely to university activities do not have big salaries, and therefore cannot afford this technology. The fact remains that there are some individuals who are providing themselves with networked computers for use from home, especially in Brazil. There are also some funding programmes by universities in Brazil and by funding agencies, as well, which aim to provide equipment for researchers by allowing them to buy it on a subsidised scheme via a number of small instalments and with low interest rates. On the other hand, there are those in the UK and in Brazil who would like to have a networked computer at home, but cannot afford it personally. Some comments illustrating these opinions are:

> "From the point of view of individual equipment, the restriction is not very high, especially in view of the average income of the majority of researchers. A computer with all resources available costs about R$ 2,000.00* and it is not expensive for researchers to buy one." (Economist, BR)

> "Financial issues affect the use of technology because it is expensive. When you do not have institutional support and you rely on your own pocket, it is related to your wage level which does not allow such expenditure as buying a machine that costs US$2,000." (Sociologist, BR)

> "Financial issues affect me personally because I would like to access e-mail from home, but I cannot afford it. It is expensive." (Economist, UK)

6.4.2 Funding by universities

In institutional terms, universities are providing researchers with the equipment necessary for them to communicate both in Brazil and the UK. Researchers in both countries consider that there has been a strong endeavour by their institutions to facilitate their access to electronic media. There are differences as between the UK and Brazil, in the sense that, in the UK, such money comes mainly from the universities' own budget, whereas, in Brazil, the money comes partly from the university budget, but mainly from funding agencies. Within Brazil itself, regional differences can be observed in the responses. Most of the interviewees, especially from the UK, commented on the free access to the university resources a factor encouraging its use. Examples of these points are:

> "Here, at the University of São Paulo, it is difficult to say that financial issues limit the use of IT because all lecturers have a computer in their offices. We also have several research centres that have very modern computers. If we have any problem we have

* When the investigation was carried out, in the Summer 1998, R$ 2,000 coreesponded to about US$ 1,800 or £ 1,125.

the FAPESP*, which has funds enough to provide equipment to research groups, research centres, etc." (Sociologist, BR)

"Here, in our department, every office has a networked computer. Besides that, there is a computer centre, with a laboratory for research and for post-graduate students. I think we are very well equipped." (Economist, BR)

"Financial issues affect the use of IT very much because of a basic question. It is our infrastructure, which is very expensive in terms of equipment, and there is also a very fast modernisation of software. We, at the Federal University of Paraíba, have funding for equipment, but it is still less than our need. In better structured universities this access is already good." (Sociologist, BR)

"Yes, here at the university you can get everything free, so there are no direct personal financial issues. Many people can take advantage from this." (Sociologist, UK)

"At the moment, because it is free, there is a financial issue. We are encouraged in the department to use e-mail rather than choosing paper, because it is cheaper." (Economist, UK)

6.4.3 Funding by funding agencies

There were no comments on this issue from the UK interviewees. In fact, all of those to whom a follow-up question was posed about funding agencies said that they were not aware of this as a significant factor. On the other hand, funding agencies have been noted by Brazilian researchers as playing an important role in providing a technological infrastructure for universities in Brazil. Many interviewees have commented that funding agencies are fundamental and indispensable, because they have equipped the post-graduate programmes and this gives access for researchers and students. Indeed, according to a number of interviewees, the technological apparatus in Brazilian universities depends mainly on the money given by funding agencies. Some researchers consider they are pressured to apply for computers when asking for research funding in their projects. It was noted that, for example:

* The Research Support Foundation in São Paulo

> "All the technology we have in our department has been bought with money from research projects, not from the university budget. It has been financed via CNPq, CAPES, etc." (Economist, BR)

> "Funding agencies have helped universities develop the infrastructure needed. We have CAPES, FAPESP, and CNPq that give us money to obtain and upgrade equipment." (Economist, BR)

> "If you ask for funding it is almost a concomitant that you should ask for a computer. This creates a straitjacket and becomes an imposition. So, if you ask for research funding you feel obligated to ask for a computer." (Sociologist, BR)

> "Funding agencies have not only provided us with the infrastructure necessary, but have also been stimulating its use. They have strongly required researchers to master this technology, because the information you provide to them must be in electronic format. There is a requirement upon us." (Economist, BR)

In this regard, one interviewee from the UK commented that

> "The use of IT here is part of the department costs rather than research project costs. I have not seen funding agencies actually giving you more money or giving you a more favourable outcome, if you like, because you are using IT." (Economist)

6.5 Political pressures

Government and university strategies that have been defined and used to guide the use of IT by researchers in universities are analysed here in terms of political pressures. Researchers were asked whether they had any knowledge of such policies. There were differences in the responses from Brazil and the UK on this topic. The majority of the Brazilian interviewees were aware of such policies, and there was near unanimity in the responses in Brazil, stating that governmental and institutional policies can affect the use of IT for research communication. In the UK, most of the interviewees from both communities were not aware of any governmental policy on this matter. Those

who agreed that there are political issues affecting the use of IT in the UK were concerned with university policies only.

6.5.1 University policies

University policies were seen as a positive factor affecting the use of computers in both countries. In fact, there was a common opinion that the strategies adopted by the university decision makers to provide the technology infrastructure necessary for researchers and lecturers are favourable to growth. The availability of computers, the establishment of networks, and access to the Internet were considered as positive factors affecting the use of IT at the universities. Interviewees also viewed the policy of making networked computers and the Internet available both for researchers and students very positively. Some comments illustrate the interviewees' opinions regarding university policies:

> "So far university policies have helped IT dissemination extraordinarily. The university bought a large number of computers and put them in the lecturers' houses at a low cost. I think it was an intelligent policy in facilitating and stimulating access." (Economist, BR)

> "In relation to my university, there is a policy to make the technology available freely. The university is providing access to everyone and is also always making improvements to the technology." (Sociologist, BR)

> "We are encouraged to use IT within the department. We are also encouraged to use it by the university. Other policies than that I do not know. I am not aware of any other particular policy. I know the university scheme already." (Economist, UK)

> "I know the university strategy of making IT available so that academics are online, students are online, we use much more computer system learning as a teaching resource, etc. That is the policy." (Sociologist, UK)

6.5.2 Governmental policies

Only two British researchers commented on governmental policies. Both reported policies relating to the availability of IT in primary schools, but this does not relate to the issues discussed here. Several Brazilian researchers discussed governmental policies relating to the provision of IT for academic researchers. It was seen as an important element in the researchers' activities over the last few years. In this sense, the Brazilian government has had two main roles: as decision-maker and as university maintainer.

As a decision-maker, the Brazilian government has been adopting strategies that have given rise to three different points reported by the interviewees. The first one is concerned with fiscal policies relating to import taxes. It has been observed that, as the policy for importing books is not to require import taxes, computers should also be imported free, at least when they are acquired for educational purposes. In this regard, the governmental policy is viewed as a restricting factor. The second relates to the availability of data produced by governmental institutions. The strategies adopted by these governmental institutions of making the socio-economic data that they produce available through the Internet were considered to be very positive. Finally, there is the government decision that making the Internet available for academic researchers is a priority. The National Research Network, launched in 1991, was considered a milestone in this matter.

As a university maintainer, the governmental policies commented on are concerned particularly with issues regarding the establishment of funding agencies in each Brazilian state. One of the main aims is to provide the resources needed by the universities to improve their technological infrastructure. There were also references to federal agencies, which have, as one of their main aims, the provision of resources to universities. In terms of decisions about how to allocate money for the university budget, whether from the federal or the state government, it was observed that universities have relatively low budgets and this is a constraint. The situation in the state universities in São Paulo appears to be better than in other states. Some examples of what was said are:

"The government objectives and planning are concerned with facilitating access, although I know that we use a very small percentage of our GDP on research and technology, as compared to other countries. We have few resources and the priorities are different at this moment. But I think that, comparing it with the previous period, government planning aims to expand information technology." (Economist, BR)

"The government initiative of making this technology infrastructure available is very positive. The use of the Internet facilitates our communication a lot." (Sociologist, BR)

"There is no doubt that there is a policy in the government. If you think about the funding that CNPq has afforded in terms of the National Research Network, you see an information policy underlying this decision." (Sociologist, BR)

"What we have perceived in relation to the government is that there is good access to databases and documents from the public sector institutions available on the Internet. It facilitates the use a lot." (Economist, BR)

"From 1992, when the protection mechanism for our computer industry -which I do not condemn because although it caused problems it had a positive side- ended, it began to be easy to import. Technical progress began to be incorporated more quickly and technological diffusion became quicker. So, in general terms, this governmental policy has been favourable, positive." (Economist, BR)

"We certainly have a great disadvantage in Brazil. You cannot buy a computer at cost price. There is something extraordinary in Brazil, which is that books never pay import tax. A computer is the same thing. Its importance is great. I cannot understand it. It is a bad policy and leaves us at a great disadvantage in relation to other countries." (Economist, BR)

"What is clear to me is that governmental policy related to computers has had a negative influence. Prices have dropped a lot,

> but the fiscal policy of the federal government is negative. For instance, one of these machines, which are very important for education, carries an import tax that is higher than imported food for cats. If the cost is cut down, you can make more machines available and permit better access not only to lecturers, but also to undergraduate and post-graduate students. It could increase communication with colleagues at the local, national and international level." (Sociologist, BR)

6.6 Electronic versus printed media

The issues concerned with information resources were approached in the interviews in terms of the relationship between electronic and printed media. It was discussed in relation to the possibility of having the printed material either substituted or complemented by electronic material. There are some differences in the responses to this question between economists and sociologists in both countries. A larger number of sociologists considered that electronic media can only complement printed ones, whereas the economists were almost equally divided between the options of complementing and substituting. The views are presented below.

6.6.1 Electronic media as a complement

Amongst those who consider that electronic media can only complement printed ones, comments concentrate mainly on the informal aspects of the communication process as being susceptible of replacement. Comments that illustrate this include:

> "The preparation of text and calculations is now totally made by computers. Besides that, bibliographic searches on the Internet, access to electronic databases, etc, have become very common." (Economist, BR)

> "The electronic medium can only complement the printed one. It will never replace the book itself. It can substitute only some stages of the publication process." (Sociologist, BR)

> "At the moment, the electronic medium complements the printed one, but I am not sure whether it can replace in a little time. There is a cultural issue, which is related to library use, particularly in our area. It is difficult to think of pure substitution for printed material. In relation to computers, you are going to print the information out anyway and archive it somewhere. The book is not going to be replaced easily. These media will co-exist." (Sociologist, BR)

> "I think the electronic medium will definitely complement the printed one. I can see only things like preparing and sending files by attachment instead of posting. Nothing more than that." (Sociologist, UK)

The main concern by those who consider the electronic media as a complement seems to be the formal outlet. The enjoyment of handling a printed document was an aspect frequently mentioned here. In fact, according to these opinions, the product itself cannot be replaced. There are a number of comments on the enjoyment of the traditional media, as exemplified below. (More of these issues are presented later, in section 6.7).

> "I tend to think that the electronic medium is always a complement. It is an instrument. I would not feel good in putting a book into the computer and simply advising people that it is available. We enjoy handling the book, and it is a pleasure that the electronic media cannot replace." (Sociologist, BR)

> "I can hardly see computers replacing the printed journal, which I read in leisure moments, in the evening when in bed, over the weekend in the club, in the bus when travelling, etc. The number of hours one can stay in front of a computer are limited, if only because of ergonomic issues." (Economist, BR)

6.6.2 Electronic media as a substitute

In terms of formal information sources, amongst those who consider that the electronic media can substitute for the printed ones, comments mainly relate to the electronic journal. It was observed that electronic media can perfectly substitute for

the initial aspects of the publication process as a whole, which involves the stages between the generation of an idea and submitting the text. However, the final product, itself, cannot always be replaced. Most find it unthinkable to substitute the printed book, though printed journals are seen as a possibility for replacement. In the case of small communities, for example, electronic journals can be a solution. Nevertheless, the peer review system must remain untouchable. There are also concerns about the costs, and about the physical space required for storing printed journals. Statistical data sources constitute another possibility for substitution. Illustrative comments are:

> "There are some stages in the communication process that can be replaced by the electronic media. The initial stages, when one is preparing a text, compiling the data, disseminating research for discussion, etc, can be replaced by electronic media with environmental economy. You waste less paper." (Economist, BR)

> "There are themes which are relevant, but do not justify the production scale that the printed media need. You sometimes have communities that deal with themes that have 50 or 100 persons involved. Electronic media without doubt, can be the solution to journal publication on themes that are relevant, but do not justify large-scale production. They could help disseminate this sort of knowledge within smaller communities." (Sociologist, BR)

> "I am actively thinking about getting the library to discontinue various hard copies of data as books because those data are available electronically. Nobody ever goes up to the library to copy lists of tables from books anymore. The Internet makes that sort of thing vastly superior." (Economist, UK)

> "Electronic media can be a substitute, for example, in terms of great volumes of data transmission. This is more expensive on paper than in electronic form. You have access to big databases via the Internet, which are important in economics and sociology. So we can handle much more new data in our research." (Economist, BR)

> "Electronic media can substitute not for the traditional book, but for the scientific journal. There is no reason to waste so much paper, the expenditure to store it, etc., if you have it on the computer. We have a huge room in the library to store journals. On the other hand, in a room like this one, we have 250 titles, with a computer, and people go there, make copies, etc. I think journals will be replaced, really." (Sociologist, BR)

> "If you already have refereed journal articles available on the Internet, with access to the most recent works in economics, etc., it is much easier than if you have to go to the library, borrow a journal, make photocopies, etc. In my opinion, electronic media can substitute, with advantages, for the printed publication." (Economist, BR)

6.6.3 Inadequacies

As a follow-up question, Brazilian interviewees were asked about any inadequacy that they may observe in the print-based publication process as a whole that might be improved by electronic media. This question was not posed to the British researchers during the pilot study. As a number of claims have appeared more recently emphasising the advantages of the electronic media, and even predicting the disappearance of the printed journal, it was decided to include this question for the Brazilian interviewees. A number of issues were commented on. However, the most common responses involved two main issues: time and costs. The time issue is concerned with speed at both the generation and the dissemination stages. Speed is the most cited factor as an advantage of the electronic media. The cost issue concerns the funding needed for the entire publication process of an electronic journal. Relevant comments include:

> "The speed of electronic media is remarkable. For example, one of the most important things for me is to search in digital libraries. If you are writing an article and need to know everything about that theme, you easily find everything you need. You can then search our web page and have access to the material online." (Sociologist, BR)

> "One thing that the electronic media solve is the time issue. One item is the researcher's time to read, think, work out and write. Then there is the time to send the product out. When it was done with printed media, there was the question of printing, re-printing, posting, sending to referees. The trajectory time was long. The electronic media have eliminated this." (Economist, BR)

> "Electronic media can abbreviate the publication process because they are more informal and agile. They contribute to reducing time and labour." (Sociologist, BR)

> "We are already producing books here in our institute nowadays. The last book I wrote was entirely produced here. The electronic medium is cheaper, faster, and more reliable because some stages of the publication process are eliminated. Apart from the cost and time, the reliability is enhanced." (Economist, BR)

6.6.4 Future trends

Another issue discussed within the context of this question concerned future media trends. A number of different opinions emerged from the interviewees, both in Brazil and the UK. Nonetheless, there was a common feeling that electronic media are developing fast, and that there is now no way back. A number of predictions state that the electronic media are going to 'increase', 'improve', 'enhance', etc. Their information provision is going to be more 'generalised', 'disseminated'. They are going to 'prevail', 'predominate'. Nevertheless, according to most of the interviewees, the electronic and the printed media will co-exist. Examples of these opinions are:

> "The trend is towards the prevalence of the e-media. It tends to predominate, despite some rejection of this kind of technology by older researchers. The youngsters, however, use it easily." (Economist, BR)

> "It is one of the few things where the future looks positive. The tendency is inexorable. You cannot go back to the typewriter whether electric or manual. As the technology develops very quickly, and gives us more facilities, there is no way back. The

> tendency is for everyone to specialise. People will leave school already knowing these things, or at least familiarised with them." (Sociologist, BR)
>
> "The paperless environment will never happen. Definitely, the electronic media is complementary to what will happen." (Economist, UK)
>
> "There will always be a desire for hard copies. The question is a question of degree. I think that all alternative forms can be complementary." (Economist, UK)

6.7 Feelings and relationships with the media

The main concern as regards not using electronic sources, or not using them very frequently, appears to be the acceptance of them by the scholarly community. The question of acceptance was actually posed to the researchers as a follow-up question about electronic sources. Some other points were brought up in the course of the interviews, mainly when discussing electronic formal sources in question two and the likelihood of substitution/complementarity in question six. These issues were the role played by the printed book, the rejection of reading from the screen and the recognition of electronic publications by assessment committees, and they are described below.

6.7.1 Acceptance of electronic journals

In terms of acceptance of the electronic journal, some differences in response can be identified. Some of the researchers from both communities and in both countries stated that electronic journals could be as acceptable as printed sources to the community. A few considered that they would be less acceptable than printed journals. For those who consider electronic journals to be as acceptable as printed ones, the acceptance depends upon issues such as quality and origin, the performance of the refereeing process and the existence of a strong editorial board. The ergonomic

aspects of the media were also reported as an important feature. (This will be discussed later on). In terms of electronic journals, most common comments were along the lines:

> "In my community electronic journals and printed journals are considered the same thing, because they are journals that already exist in the traditional media and can also be subscribed to via the Web. Therefore, they are well-established journals, with a good editorial board, referees, etc. There are also essentially electronic journals, as the one in computational economics that I mentioned before, which are very serious." (Economist, BR)

> "We feel a bit suspicious about the credibility of a purely electronic journal, but I suppose that in the future it will have as much credibility as a printed one. It will take some time for us to make sure they are undergoing peer review, have a good institution supporting them, etc." (Economist, BR)

> "Electronic journals can certainly be as acceptable as printed ones. We have bought a package from Michigan University which contains 250 scientific journals on CD-ROM and it has been very useful." (Sociologist, BR)

> "Electronic journals are going to be important sooner or later. However, we really always go for the best journals, the well-known printed journals and we want to publish in these journals. I am not sure how it is going to develop." (Economist, UK)

6.7.2 Praising the printed book

The electronic book was considered by a number of the interviewees who mentioned it as absolutely unacceptable. In fact, a very common comment was that "the book is irreplaceable". The printed book and its characteristics have become something that involves more than use: it implies an enjoyable relationship. In this sense, it was remarked that:

"I do like feeling immersed in books, rather than sitting in front of a computer." (Sociologist, UK)

"Printed books are irreplaceable. There is the pleasure of reading and manipulating the object." (Sociologist, BR)

"There is a sensorial experience with books. When I have a book in my hands, I see its beauty, I feel the book, I smell it, and it has a certain fetish that goes beyond the information. I do not know whether it is going to be replaced in the future." (Sociologist, BR)

"I think electronic sources can substitute for the printed ones, but I am very conservative. I enjoy handling the book, looking at its cover, recording its smell, and this material dimension of communication media is still very important." (Economist, BR)

"I think electronic sources are as acceptable as printed ones, but the whole community does not think the same. There is still worship of the book and the printed page." (Economist, BR)

6.7.3 Rejecting reading from the computer screen

Another point that emerged concerning reasons for not using electronic formal sources, or using them very little, related to ergonomic issues more especially a rejection of reading from the screen. In this connection, the general comment was that everyone had to print out electronic sources to be able to use them. Some of the common responses were along the lines:

"I prefer to download electronic journal articles and read them on paper. It is very bothersome to read from the screen. It is unpleasant and I do not like it; it does not allow reflection, or making notes on the side of the text: all these things require the traditional publications." (Economist, BR).

"It is an inconvenience to read journal articles from the screen. The majority of my colleagues and myself prefer to read the text from paper. Since they can be printed out, I can use them." (Economist, BR)

> "Electronic journals I have never used, even knowing that they are already appearing. I still need to read on paper. I cannot read from the screen, though I work many hours a day with a computer in order to write. However, for me to read and reflect, I have to do it on paper." (Sociologist, BR)

> "My problem is that I find it very difficult to read an article just having it on the screen. I always print it out, anyway." (Economist, UK)

6.7.4 Recognition of electronic publications

Although some interviewees reported publishing in electronic format, using electronic sources, etc, some Brazilians were concerned about how these publications are to be assessed as legitimate 'scientific' output. It was observed that:

> "We have here, in Paraíba, one electronic journal that has only an electronic version, but there is not a search tradition for this journal. Even the quality assessment of publication in electronic journals is not very well consolidated." (Sociologist, BR)

> "I think electronic journals can be as acceptable as printed ones, but the issue of the control groups remain. It is reflected in the last CAPES initiatives in the evaluation of post-graduate programmes. They evaluated our work in a different way, depending on the vehicle in which the work has been published. This example can illustrate my concerns about these sources." (Economist, BR)

6.8 Impact on productivity

Interviewees were asked about the impact that the use of IT may have had on their own productivity, either increasing or improving it. (Increasing productivity means increasing the number of publications. Improving means making it easier to produce the same number of publications). The great majority in the two communities of researchers in Brazil and the UK agreed that it could both increase and improve. A few interviewees considered that the use of IT could either only increase, but not improve, or only improve, but not increase productivity. Amongst these, a larger

number consider that it improves, but not increases. Some of the comments on improvement are related to practical activities, rather than to intellectual activities.

Nevertheless, electronic media are clearly considered fundamental nowadays and, without a doubt, are seen as affecting productivity. There were a number of different opinions related to the sort of increase or improvement that the technology can bring to researcher productivity. Examples include more facility to contact colleagues and use their output, doing corrections to a text, more information access in less time, contact with the knowledge frontier, reduction in the time spent on the work, increase of interactions, stimulus to write more and better, etc. There are two aspects, however, which are most frequently cited: practical activities relating to the quality of the text itself, and enhanced information access. There are also some concerns. Some researchers observed that speeding up might actually worsen the quality of the work, by not leaving time to reflect. Comments from those who consider that the use of IT helps both to improve and to increase productivity include:

> "It both improves and increases my publications. It improves because of the access to bibliographies. So, it improves the quality. And the amount increases because of that greater access." (Sociologist, BR)

> "I think it helps to increase my work by the extent to which I have more access, more information: it gives me more speed, so I can do things faster. It both facilitates doing things faster and also improves the quality, because I can do a more efficient bibliographic search, come closer to the scientific frontier. The access by Third World researchers to the science frontier is more democratic now." (Economist, BR)

> "It helps increase and improve my work because I can obtain access to more and more information sources and the access is quicker. So, I do not have to write a letter and wait for several weeks. I can look at the www and in a matter of minutes I have the information. So, in that sense there is an improvement." (Economist, UK)

> "I think it helps simply because of the availability of data. Everyday I have a new set of working papers on my desktop and download it automatically. So, I can look and see what other people are doing very regularly. That would not exist without the e-mail and the Internet. It is like a jump, a huge jump." (Economist, UK)

In the whole sample, only one researcher did not agree with both aspects namely improving and increasing productivity. A sociologist from the UK said:

> "Not really. We can say that it can replace things like going to the library. If you are looking for bibliographic information you can see it here. But I do not think it has qualitative changes of that kind. I am not aware about it being good or bad. I do not think there are dramatic changes."

Amongst those who consider that the use of IT helps improve, but not necessarily increase productivity, it was said that:

> "It does not increase production. An increase in my publications is due to an increase of my brain work, and the technology would not help that. To improve, yes, in the sense that I can know more quickly what everyone has done, and that is a great improvement. I can have more access to information systems and it has increased the ease of accessing documents which used to be more difficult to access before." (Economist, BR)

> "I do not know whether it has increased my productivity, but in relation to quality, certainly yes, because of the speed of electronic communication. It is easy to submit work to colleagues for them to read and give their opinion. You receive the opinions and when you send it to a journal it is already an improved source. It also affects things in a second way. Some time ago, there was a lack of information. Now I have better access both to people and to information. I can be up-to-date with the latest discussion occurring in England, in the US, in France or wherever. It obviously improves the quality of my discussion and enables me to participate." (Sociologist, BR)

> "I would say it improves because it is very, very useful for me to sit here and find out which information is in the libraries, rather than having to go there. I can sit here and find where it is available before I go and access it. It is very useful. It definitely helps." (Sociologist, UK)

It is worth emphasising some of the criticisms that were brought up in the discussion of this issue.

> "The use of IT helps both improve and increase productivity, but it is not a *sine qua non* condition. It improves the presentation form, but the quality is mostly related to your own preparation, your reading level, your background. If you do not improve your knowledge on your topic, the computer does not make you a writer. But if you are a writer, and have something to communicate, the computer helps you do it in less time. The quality of the text depends on the researcher. The presentation quality depends on the use you make of the machine." (Sociologist, BR)

> "The use of IT helps in both aspects. But one thing that is important is that the computer technology does not replace reflection. It does not replace the language knowledge. So, we frequently see works very well presented in terms of computer work and very weak in terms of content. Computers cannot be used to mask a weak content." (Economist, BR)

6.8.1 Collaborative work

As there appears to be a link between collaboration and productivity, a question about the interviewees' experience with collaborative work was included here, as a follow-up question on productivity, for the Brazilian interviewees only. It was decided to introduce this mainly because of comments that were made in the pilot study in the UK in response to other questions. A number of researchers reported experiences with collaborative work as a consequence of the use of electronic communication. According to the overall comments, and to some of the responses to this specific question, opportunities for collaborative work, using IT for research communication purposes, have grown both in Brazil and the UK. It allows researchers who are

geographically distant to exchange dialogue and papers easily, and it facilitates collaborative work.

Various collaborative activities were reported. Interviewees from the UK reported collaborative work with colleagues from other parts of England, from Scotland, New Zealand, Indonesia, Switzerland, the USA and Canada. Interviewees from Brazil reported a number of collaborative activities with colleagues from other states in Brazil, Latin American and Caribbean countries, the USA, Canada, England, Germany, France, Italy and New Zealand.

The sort of collaborative work reported mainly concerns research projects carried out by research teams involving people from geographically distant places. There is also experience of publishing journal articles via co-authorship, organising books in collaboration and contributing chapters to books. Previous questions have already mentioned this issue. Some other illustrative comments include:

> "I work on a project with people from the US and obviously the only way to communicate is through e-mail." (Economist, UK)

> "I am writing an article with two colleagues, each of us in different places. One is in Germany, the other in São Paulo, and I am in Rio de Janeiro. Without this technology it would be impossible." (Sociologist, BR)

> "I have carried out two researches with two different groups. The first one with a Canadian group in which we worked via the Internet, and now I am carrying out research with a German group. We exchange all data via the Internet." (Sociologist, BR)

> "I translated a book from a German author together with a colleague from the state of Santa Catarina, via the Internet. There is also an anthology that I am organising, and all the exchanges have been made via e-mail." (Sociologist, BR)

> "I have been working with people from Canada on a report about research carried out in Brazil. We edited it along with those colleagues." (Economist, BR)

> "There have been more opportunities for co-authorship. I have published together with colleagues from London and from other states in Brazil." (Economist, BR)

> "The use of IT facilitates collaborative work, particularly with people who are geographically distant. I am writing a book chapter with a colleague from Ribeirão Preto and we exchange texts via e-mail. It is much easier than would be via the ordinary mail or fax." (Economist, BR)

6.9 Impact on creativity

Researchers were asked about the effect that the use of IT might have had on their creativity. There are differences between the two communities of researchers, both in Brazil and the UK. Most sociologists disbelieved that such an effect occurred. In the case of economists, however, a number agreed that there is such an effect.

Amongst those who did not agree, there was, in both communities and in both countries, but especially amongst sociologists, a common concern to emphasise electronic media as only a tool, which had no relationship with creativity. However, many comments included the recognition that there is now more access to information, which may, or may not, eventually lead to more creativity. Here are some of the opinions:

> "The use of IT does not have any effect on creativity. Computers make things flexible in terms of text production, but they do not improve either creativity or quality. These questions go beyond the technological issue. The technology is only a medium, and a practical medium." (Sociologist, BR)

> "Computers are machines, a support only. Nothing of this can affect your creativity." (Sociologist, BR)

> "It improves the quality of the intellectual product because you can use a world-wide bibliography. But I cannot see any direct relationship with creativity." (Sociologist, BR)

> "Not at all; creativity has nothing to do with the use of technology." (Sociologist, UK)

> "I do not think the use of IT affects my creativity, no. Because of the sort of research we do, we have those clear ideas about what we are going to do in terms of creative ideas beforehand. I think it increases productivity. Creativity, no." (Economist, UK)

Amongst those who agreed in both communities and in both countries, one common point was again that there is much more access to information. This can be provocative, in the sense that the researcher may come across more ideas by serendipity than with other media. It may also improve creativity because the use of IT makes it easier and quicker to find out what other researchers are doing, and this can lead to a different view of the research theme. Another aspect that was mentioned was that as more time is available when things are done faster, this increases the researcher's room for creativity. The comments on this include:

> "I presume the use of IT has an effect on creativity because you have more information available. You come across some interesting ideas and you can use it in your own research." (Economist, UK)

> "I believe so. When you have more access to a more diversified and broader volume of information -facilitated by these media- the possibility of creation becomes bigger. We are dealing with a larger volume of diversified data and information." (Economist, BR)

> "I would say that, in my case, I have more ideas for research or suggestions for themes that are relevant to research than I am able to develop. You have more contact with new themes." (Economist, BR)

> "Of course, it does because it reduces a lot of the time we spend working on routine things. It gives us more useful time, and when we have time we can create." (Economist, BR)

> "I think the use of IT has a positive effect because it gives you more space for creating. You have more time, more access, etc. I think it increases productivity and creativity." (Sociologist, BR)

6.10 Impact on motivation

Impact on motivation was examined in terms of the availability of IT leading to more desire for communicating research. The majority of the interviewees, both in Brazil and the UK, agreed that the availability of IT for communicating research has had an impact on their wish to communicate. IT availability was considered as a stimulant because of the additional facilities it provides. The immediate, interactive character of electronic communication, and the possibility of contacting people wherever they are, were mentioned as positive factors. Common opinions on this matter were along the lines:

> "I think it does. The greater the facility, the better the contact with people." (Economist, BR)

> "Of course it does. You have a challenge because you have a costless e-mail and it depends only upon yourself. The communication barrier is over. It is so fast and efficient that it stimulates you to do so." (Economist, BR)

> "It is something that we discuss in theoretical sociology. Not in relation to the machine, but in a more abstract way. You only wish to do things after knowing that you can do them." (Sociologist, BR)

> "I have no doubt that it does. When I arrive here and the connection fails, so I have no access to my e-mail, I lose my temper all day. I am extremely dependent on it." (Sociologist, BR)

> "It is true. I communicate far more quickly because of the use of e-mail. I respond far more quickly. It has definitely changed the way I communicate with people." (Sociologist, UK)

> "It facilitates the communication process and reduces the barriers. It definitely breaks down the barriers." (Economist, UK)

> "That is very much a personal thing. I would say yes, although I am a little bit shy about sending my working papers around through the Internet. I certainly read what other people do, but do not yet let others read what I do." (Economist, UK)

A few interviewees did not regard IT as a major motivating factor. They mentioned such things as:

> "If I have not been communicating on e-mail, I would be sending fax. I do not worry about that, really." (Economist, UK)

> "It is very new and I am a little suspicious about it. I may be the slowest person to familiarise with these things. But that is my personal style. I have seen it happen to others very quickly." (Sociologist, BR)

> "It has a contrary effect. I enjoy personal contact. There is an imposition of this medium upon me and it upsets me. It is an invasion of our private life." (Sociologist, BR)

6.11 References

1. **Kvale, S.** *Interviews: an introduction to qualitative research interviewing*, Thousand Oaks; London: Sage, 1996, pp. 168-169.
2. **Ibid.,** pp. 193-196.

CHAPTER SEVEN

DISCUSSION

7.1 Introduction

The aim of this chapter is to discuss the results obtained from the data collected in this investigation in the light of previous research findings from the literature. The discussion is presented according to the research objectives stated in chapter one, and involves the combination of data from both the questionnaires and the interviews. For some of the issues discussed, account is also taken of the Brazilian background commented on in chapter two. The approach that underlies the discussion is based on both systems theory and the social anthropology approach to interactions within communities, since it relies on the model developed earlier. Before discussing the results in terms of the research objectives, some comments about the background variables need to be made.

7.2 Differences and similarities in background

7.2.1 Age distribution

Differences have been found relating to the age distribution between the two communities studied. Although the population comprises mostly older researchers (the reason for that is commented on in chapter two), sociologists are, on average, older than economists. This may be related to the fact that many prominent university economists are called away to work either in the government or in private institutions, such as big banks and other companies. This may bring about more opportunities for younger researchers in economics to become active members within scholarly communities in the area, especially in post-graduate programmes.

7.2.2 Gender distribution

As expected, males comprised the majority of the population investigated. Nonetheless, while males form the great majority of economists, sociologists appear to be fairly evenly distributed by gender. The same distribution of males/females as in the questionnaire population was also employed in the interview sample of economists, but the interview sample of sociologists differs from the questionnaire sample in including more females. The differences reflect two facts. Firstly, there has always been a high percentage of females attending sociology courses in Brazil. Economics (like engineering) has traditionally attracted fewer female students. Secondly, it appears from the analysis carried out on CAPES's data, that a majority of the most productive sociologists in the country are female, and, hence, were more likely to be chosen for interview.

7.2.3 Seniority distribution

Highest degree distribution

Similarities exist for the distribution of researchers in the two communities in terms of highest degree. The great majority have doctorates. The reason for this is simple. There is a requirement to have a doctorate in order to be entitled to teach and supervise post-graduate students in Brazil, even at master's level. Therefore, only a small percentage (circa 6 percent) of people with masters was identified in this study and they are found in some of the smallest centres where there is probably a shortage of doctorates. Amongst those who are masters, a few wrote a short note saying that they were currently completing their doctorate programme. In the case of the interviews, every interviewee was a doctor and most of them had attended a post-doctorate programme.

Rank distribution

There are no differences between the two communities in terms of rank. The majority of the population consisted of senior lecturers. The reason for that also appears to be simple. In federal universities, when candidates complete their doctorate programme

they are automatically promoted. It is not exactly the same in the state or municipal universities, whose ranking nomenclature is actually not always the same as for the federal system. The equivalent initial university grade for doctors differs somewhat in requirements between federal universities and others. However, as the majority of the population come from federal universities, it was not worthwhile making this differentiation in the questionnaire. The federal university classification was adopted throughout. As regards the small number of professors, this certainly reflects the fact that there are both stringent requirements and very few vacancies for promotion to the professorial level.

7.2.4 Mobility distribution

Intellectual mobility distribution

Differences were found regarding specialism. The sociologists have been working in the same specialism longer than the economists. The Brazilian economy is especially dynamic as a result of the frequent changes that have occurred in the country, mostly because of political decisions. This may have helped stimulate changes of research topics amongst economists. As noted in chapter one, changes in both national and international activities can have an influence on the topics being studied in particular subjects.

Physical mobility distribution

The number of years working in the same institution showed no significant differences between the two communities. This may reflect at least two facts. Firstly, as already stated in chapter two, research in Brazil, as well as post-graduate programmes, is mostly carried out in public universities, especially the federal ones. It makes those interested in doing research and working on post-graduate programmes stick to these institutions. Secondly, there is normally one federal university in each state, in the capital. State or municipal universities, though existing in some states, are not always strong in post-graduate and research work. The state of São Paulo is an exception. The federal university there is small, and the state ones not only predominate, but also constitute the best ones in the country in many fields. Because

of the huge distances between capitals in Brazil, it is not common to have researchers moving from one university to another. In fact, the migration of the middle and upper classes as a whole in the country is very low. Therefore it is actually to be expected that physical mobility of researchers will be low, as well.

The other way of measuring physical mobility was to identify the world region where the respondent's highest qualification was obtained. It was suggested that this might have an effect on the use of computers. Although the majority of the respondents had graduated in Brazil, amongst those who graduated abroad, more sociologists graduated in Europe and more economists graduated in the USA. This is probably due to the strong influence of the American school of economics on Brazilian economists (and not only on the Brazilian, as commented in chapter one). Equally, it is true as regards sociology, that the strongest influence comes from the European school of sociology.

7.3 Environmental factors: differences in the pattern of resources use

Social scientists have been reported in the literature as less technologically oriented than scientists and more technologically oriented than humanists. In fact, in the continuum that ranges from the hardest (sciences) to the softest (humanities) disciplines, the social sciences lie in the middle. Likewise, according to a number of research findings, the social sciences also lie in the middle of a continuum that ranges from the most rapid technology adopters (scientists) to the lowest rapid technology adopters (humanists). In this study, as was suggested in chapter one, economics may lie at the hard border of the social sciences, with sociology in the middle. In order to see whether there are differences within the social science division itself, the use of traditional and electronic resources have been measured. The aim was to look for differences in the pattern of use between economists and sociologists for each class of resource, and so to see whether overall patterns identified in the literature could also be found in this study. This section discusses the pattern of resource use according to the data from questionnaires and relates this to the Brazilian population. Comments taken from the interviews provide additional information.

7.3.1 The use of equipment

In order to communicate research from the most informal initial contacts, through the intermediate processes of seeking information and preparing a text, to the final delivery of the product, social scientists interact with a range of equipment. Currently, both traditional and electronic equipment are being used by economists and sociologists to perform these tasks in Brazil, and there were not many significant differences found in the pattern of use. This may be due to the fact that nowadays almost everyone uses computers for research.

Nevertheless, differences were found relating to three sorts of equipment. Firstly, there are differences related to a higher use of networked computers on the researcher's desk by economists. As computers have been mostly provided by funding agencies, this might have had an influence on the situation, since economists have received more funding than sociologists in Brazil. Evidence that this difference exists elsewhere was found in work reported by Lindsey. He reported that economists acknowledged a larger percentage of outside funding than sociologists, from a study of journal articles carried out in the early 1970s.[(1)]

Secondly, differences were also found amongst the respondents in the use of stand-alone computers at home. Costs of computer equipment for networking, such as modems and other facilities required, telecommunication costs, plus the costs of subscribing for a private provider, have an influence on this situation. McKnight and Price found a similar pattern of computer usage at home in the UK.[(2)] Sociologists are using stand-alone home computers more than economists. This may be due to the combination of two factors. Firstly, sociologists are less well-equipped at work, and so have to equip themselves at home; secondly, costs of electronic facilities and telecommunication are high.

Finally, there are differences in the use of typewriters, the least used item of equipment (but still used). Sociologists are using typewriters more than economists. This may relate to personal preference, since, contrary to expectations usage did not correlate with age in this survey. An illustration obtained from the interviews, and evidence obtained from previous research may cast some light on this question. The

only interviewee in the UK who did not have a computer, but had a typewriter on his desk instead, was an older sociologist. There was a computer in his office, but it was covered and kept far from his desk. McKnight and Price found another older researcher still using a typewriter in the UK and reporting no intention to change, since he was totally 'unimpressed by all the marvellous electronic media to which colleagues seem increasingly addicted.'(3)

In summary, economists and sociologists are using both traditional and electronic equipment for communication purposes. Typewriters are still being used to a minor extent, mainly by a few sociologists. Stand-alone computers are widely used, mainly by sociologists at home. Economists, who have been better funded than sociologists, have better access to networked computers on their desks and use them more than sociologists do. These findings are compatible with previous studies carried out in the UK.

7.3.2 The use of facilities

The majority of the respondents are still using traditional facilities more than the electronic ones. However, apart from the use of the university library, which still constitutes the traditional facility most frequently used (weekly), a low frequency (annually or monthly) of use of all the other facilities has been found. Schauder found similar results for university library use in 1992 in his survey of researchers in the UK, the USA and Australia.(4) These results reflect the fact that, despite the range of new facilities available, university libraries continue to be a well-established resource with which social scientists interact in order to obtain the information sources needed for research purposes.

In terms of electronic facilities, data from the questionnaires reveal that the most frequently used facility is the World Wide Web (78 percent). According to comments made in the interviews, this use has been mostly for searching for information. These results are consistent with recent studies reported in the literature. It is worth noting that empirical findings for the use of the World Wide Web by academics has only started to appear in the literature very recently. McKnight and Price found a similar (75 percent) amount of use amongst British researchers.(5) Voorbij reported a similar

purpose of use amongst Dutch academics, that is, researchers use the World Wide Web primarily to search for information.[6] These results show that this facility, which has only been available for about five years, is already having an impact on the scholarly communication system in terms of use by academics for research purposes.

The third facility discussed here is the e-mail. The use of e-mail is widely reported in the literature, since the late 1980s. Throughout the 1990s this use has gradually increased and over the last three years a number of research findings show percentages of use above 95 percent. Almost all academics who have access to a networked computer now seem to use e-mail extensively, regardless of country. The large majority of the researchers interviewed reported using e-mail very frequently and for a diversified number of purposes, especially to contact colleagues at local, national and international level. They also commented that most of their colleagues are doing the same. Overall, no major differences were found in the use of e-mail by economists and sociologists in Brazil. Indeed, only two interviewees reported not using either e-mail or computers in general. The first one was an economic historian, who said he was 'the only person in his department who was not using it', and defined himself as 'the last one of a species nearing extinction'. It is likely that his subject-matter might have an influence on his non-use. In fact, his own description of his communication patterns is closely related to the descriptions given by many humanists. The other one was a director of a big bank who said he left the academic environment in 1994, 'when the quality of the lines was not yet good.' Although he continues doing research and publishing a lot, his position as a bank director (he had three secretaries!) probably has an influence on his non-use. Both the influence of the subject-matter (e.g. the discussion in chapter three) and seniority (e.g. Lazinger's[7] and Cohen's[8] studies) have been reported in the literature as relating to a lower use of computers.

Data from the questionnaire showed a few differences between economists and sociologists in relation to the use of print and electronic facilities. These related to the use of web sites, bulletin boards and publisher's catalogues. Economists use the two electronic resources more than sociologists, whereas sociologists use the traditional publisher's catalogues more than economists. In general, economists appear to be more inclined to use electronic resources than sociologists. This higher use of web

sites and bulletin boards can be related to the increasing number of sites which provide information of the type mostly used by economists. It may also relate to the availability of networked computers on their desks.

7.3.3 The use of information sources

Electronic formal sources have become increasingly available, not least for scholarly journals. Nevertheless, the tradition of the printed media has proved strong amongst economists and sociologists in Brazil, since almost all the respondents (99 percent) used printed sources, particularly journals and books. Studies reported over the last three decades have shown that journals and books are used extensively and to a similar extent by social scientists. The results obtained in this study are consistent with this. More generally, it appears that much of the information needed by these researchers is still in printed form.

Economists and sociologists in Brazil are also using conference proceedings, discussion papers and technical reports to a great extent (more than 95 percent of use). This diversified use of information sources has not been widely mentioned in the literature, which has been mostly concerned with the use of journals and books. However, similar results regarding the use of conference proceedings were found in a nation-wide survey of scientists carried out by the Royal Society in the UK, which showed a high use of journals, books and conference proceedings (100, 99 and 95 percent respectively).[9] Conference proceedings occupy an intermediate position in publishing terms between books and journals, which may explain their high use.

Technical reports are mostly concerned with governmental and industry information and have been more used by economists than sociologists in Brazil. This sort of information plays an important role as input for research in a variety of topics in social sciences, but especially in economics, which appears to provide the reason for the pattern of use found in this study.

The use of discussion papers can be related to the currency of the information conveyed. National institutions such as the Applied Economic Research Institute (IPEA), and international organisations such as the World Bank have been publishing

series that disseminate the findings of work in progress in order to encourage the exchange of ideas. The main aim is to get findings out quickly. This may be the reason for the high use of discussion papers by economists and sociologists in Brazil.

The results of this study, relating to the use of conference proceedings, technical reports and discussion papers, are in line with previous results reported in a study of social scientists in the USA.[10] In such study, it was concluded that, because social scientists seek faster and easier access to information, these publications are basic to many scholars.

Although the preference for well-established information sources is reflected by this study, some indications of change are suggested by the amount of use of electronic journals, electronic conference proceedings and full-text databases. As the data indicate, this does not represent substitution, but rather an addition. The large percentage of researchers (68 percent) using electronic journals was unexpected. Current state-of-the-art investigations indicate that there have not yet been appreciable changes in attitudes to electronic publishing (and some citation studies support this). However, use is as yet infrequent, occurring on an annual or monthly basis. This low use was commented on by a number of interviewees, and is consistent with various previous studies. Adams and Bonk, who found 32 percent of use in 1992, reported that this was mostly infrequent.[11] Gomes and Meadows found 46 percent use of electronic journals in 1996 in the UK, mostly on an annual/monthly basis.[12] Voorbij found 58 percent of use in a survey of academics in Netherlands in 1997, and the most frequent use reported was less than weekly.[13] Such a growing trend in the percentage of researchers who have made some use of electronic journals may be a consequence of the growth in both the number of electronic journals and awareness of them. The low frequency of use may then be related to the continuing importance of printed sources. The actual use of electronic sources may reflect employment for particular purposes, or for information that is only available in electronic form. As stated below, there has been an increasing availability of information that is relevant to social scientists in electronic form.

The high use of full-text electronic databases (67 percent) reflects the increasing availability of publications in full-text format on both the Internet (though not always

as a 'database') and CD-ROM. A number of national and international organisations have been producing documents that are made available electronically. There are also resources such as Pro-Quest Direct, which have been widely available in university libraries in Brazil. This is one issue that has not been either extensively or frequently explored in the literature. Nevertheless, Adams and Bonk found 20 percent using full-text databases in their study in 1992.[14] These results may suggest that use is increasing.

The findings relating to the use of electronic conference proceedings can also be linked to the increasing availability of conference proceedings in electronic format, both on CD-ROM and the Internet, as commented on by some interviewees. As the printed copies of these conferences are often available only to people who attend the conference, the electronic version has a wider potential audience and has been used by researchers.

In relation to the use of online numeric databases, the usage reported (55 percent) may again reflect the increasing availability in electronic form of statistical data produced by national and international organisations. Such data are widely used by social scientists, especially economists. Some of the main producers of these data in Brazil, such as the Brazilian Institute of Geography and Statistics (IBGE) and the Getúlio Vargas Foundation (FGV), have made them available on both the Internet and CD-ROM. In addition, data from international organisations, such as the Organisation for Economic Co-operation and Development (OECD), the International Monetary Fund (IMF), the World Bank (IBRD), etc., are also available in electronic format. Previous results reported in the literature relating to the use of databases do not highlight the use of these 'numeric' databases and therefore do not provide useful data for comparisons.

The pattern of use of information sources is very similar between economists and sociologists. However, differences were found in relation to three types of sources, all of which are more used by economists: electronic conference proceedings, online numeric databases and technical reports. This reflects the nature of information that economists usually need as input for their research.

7.3.4 The use of information services

At the moment, economists and sociologists in Brazil are using both traditional and electronic services, though not very frequently. Although not the most used overall, personal bibliographical databases constitute the service most frequently used (weekly) by those who have them. This may be related to evidence presented by Ellis in his study of information-seeking patterns of social scientists.[15] Firstly, he found that following up references or footnotes is a major characteristic of social scientists' information-seeking patterns. Secondly, starter references are frequently obtained by seeking out people who know about the topic. In this regard, Ellis draws attention to informal contacts as a prominent feature in these patterns. This latter may relate to evidence found in the present study: the increase of informal contacts brought about by the use of e-mail. It is likely that personal bibliographic databases have been developed with references obtained through both informal contacts and references from books and journals, so relating to the first point made by Ellis.

Library catalogues constitute the most used information service, and this is consistent with the high use of the university library found in this study. Card catalogues are still used more nowadays than OPACs. This can be related to the fact that card catalogues are widely available in the Brazilian university libraries, whilst OPACs do not yet constitute a well-developed tool, mainly because of poor investment in these resources by some Brazilian universities. The least used service is document delivery and this reflects the quality of this service in Brazil. The only document delivery service available nation-wide is the 'COMUT' (from 'commutation', since it involves the acquisition of a credit account that is used as a means of payment for obtaining journal articles). The service is a hybrid one: the database and the search engine are electronic, but the delivery is via fax or ordinary mail. A number of respondents to the questionnaire added a small note observing that this is an expensive, often useless, and slow service.

The co-existence of electronic and the printed media is readily observed in terms of the use of information services. The majority of the respondents use both. However, differences were found in the pattern of usage of information services as between economists and sociologists. They relate to a higher use of the whole range of

traditional services (not including document delivery, which is equally little used) by sociologists. This appears to confirm the tendency observed in the data regarding all categories of traditional versus electronic resources. Economists employ electronic resources more than sociologists, whilst correspondingly, sociologists employ more traditional (print-related) resources than economists. In terms of the use of resources for communicating research, economists appear to be more technologically-oriented than sociologists: this is in line with the previous discussion of the influence of subject on communication patterns.

7.3.5 The use of information resources in general

This study found a large number of correlations between the frequency of use of the majority of information resources. These correlations confirmed both the patterns of use and the differences between economists and sociologists described previously. There were also a number of correlations between experience with computers (in terms of number of years using them) and the frequency of use of a large number of other electronic resources. Again, these correlations confirmed previous patterns and differences identified. Hence, there is a direct link between the use of computers and networks and the use of most electronic resources. Results from previous studies underline this point. The study carried out by Adams and Bonk, for example, found about 30 percent of respondents relating the availability of computers and networks to the increase of use of electronic resources and services.(16) Results from the Abels et al's study confirmed a 'significant relationship' between computer experience (period of time) and intensity of use of electronic services.(17)

7.4 Environmental factors: perceived pressures

The way researchers perceived and reported pressures brought about by the introduction of new technologies into the academic environment are discussed in this section. Results are discussed for the Brazilian survey. A summary of comparisons between Brazil and the UK is presented in section 7.8.

7.4.1 Perceptions of social pressures

Because the system of values shared by researchers affects their activities within the scholarly community, expectations of colleagues may have an influence on their reactions and attitudes. The great majority of researchers interviewed in this study in Brazil agreed that there have been expectations on the part of their colleagues for them to communicate electronically. These expectations make them feel under pressure to use computer-mediated communication. However, they are related to informal, rather than to formal communication, and, more especially, to the use of e-mail.

This is consistent with previous results reported in other studies in other countries. Covi and Kling, for example, have reported that "the few faculty members who refused to use e-mail, reported being pressured by peers and administrators who wanted to either eliminate print mail or increase their responsiveness."[(18)] Cohen's findings also showed that faculty and administrators' expectations for networked computers "will add to peer pressure on the remaining faculty who have not yet used computer-mediated communication."[(19)]

In terms of informal communication, it is indubitable that e-mail, as an informal channel for discussing research, has become pervasive throughout the scholarly communication system. This is an instance where the system has been highly sensitive to an external (new technology) element. The significance of e-mail use for interactions amongst researchers in social sciences is clearly apparent in this study, and the results confirm a number of findings already commented on in chapter three. The importance of informal contacts for research communication amongst social scientists has been well discussed in the literature, from the INFROSS study[(20)] to more recent ones, such as the Ellis' study.[(21)] The pressure to use e-mail as a communication channel for informal contacts has led to this channel becoming increasingly essential to researchers during the second half of the 1990s.

The major reasons for this are because e-mail is cheaper than telephone calls and visits, faster than the ordinary mail, sometimes more convenient than going to someone else's office, and both a powerful tool for dialogue and an efficient document

carrier. These features make many people use it and expect others to do the same. Besides that, it is the current fashion, and this makes many feel compelled to use. Some evidence for this was found from the number of researchers who commented on being under compelling pressure to use e-mail because everyone else was doing it.

Researchers' own expectations in this matter were assessed through the questionnaire. The majority of the respondents agreed that they expect the use of IT will increase informal communication. Although there is an overall similarity, differences were found in detail between the groups surveyed. There were more economists than sociologists agreeing, and fewer disagreeing. It is worth noticing that two of the sociologists interviewed commented on the upsurge of trivial communication with these new technologies. This may cast some light on the differences found in the questionnaire about own expectations.

As regards formal communication, perceptions of the Brazilian interviewees differ. There are more economists than sociologists who perceive themselves as under pressure to use electronic formal sources. This appears to reflect a greater awareness of the availability of these sources amongst economists. In relation to electronic journals, for example, some economists mentioned that about 20 percent of the journals in their area are in electronic format, whereas no sociologists seemed to be acquainted with relevant titles. The reason that a number of researchers from both communities do not feel pressured to use electronic journals may be because the best journals in both areas are still available in print format, and these are the important titles both to publish in and to read. There is also the issue of recognition by their institutions, as pointed out in McKnight and Price's study.[22] On the other hand, there are a number of other electronic sources of interest to economists, mainly comprising statistical reports, numeric databases and other publications concerned with statistical data (such as the ones published by national and international organisations), which are increasingly available in electronic format. This may have an influence on the fact that although researchers from both communities use electronic sources, there is a larger number of economists than sociologists who feel under pressure to use such sources.

In relation to data from the questionnaire, nearly 60 percent of respondents from both communities agreed to expecting increased publishing in electronic journals in the near future. About 40 percent were not sure and, surprisingly, only a few disagreed. A few interviewees reported having already done so. These results confirm previous research findings. McKnight and Price, for example, reported that 12 percent of the subjects in their study in the UK in 1998 had already published in electronic journals.[23] Budd and Connaway reported that only 3 percent of their respondents had submitted to an electronic journal in the USA in 1995. [24]

7.4.2 Perceptions of economic pressures

The majority of the researchers interviewed feel themselves under pressure to use electronic resources for research communication purposes because their institutions and funding agencies have invested money to make such resources available. This pressure is therefore exerted in terms of financial encouragement rather than as financial restriction, and is closely related to the issue of availability and use. Previous studies reported in the literature have pointed out the relationship between availability and use of computers. According to responses to the present questionnaire, around 90 percent of the respondents have computers available for them to use either at work, or at home. Every interviewee had a computer on their desk, though a few only had stand-alone computers. Alongside the provision of computers, there is the fact that electronic network access at the work place is free. Such a 'free' use has also been an encouragement.

There are, however, difficulties faced by most of the universities in Brazil, whose budgets are usually very much below their needs. Higher education in public universities at federal, state or municipal level is free. Universities are not allowed to be financially autonomous and make money themselves: they must use the amount of money allocated to them by the government. This leads to the need to interact with external bodies in the system: the funding agencies, especially those from the Ministry of Science and Technology hierarchy, and also state support agencies. The role of funding agencies in the scholarly communication system appears to be similar in the USA. In the report of a National Enquiry in the 1970s[25] it was emphasised that all the elements that constitute the system are influenced by two outside factors, the

actions of funding agencies and the development of new technology. This assertion is also made in the second national survey of scholars, in the second half of the 1980s.[26] Fuchs points out that, in the USA, universities, often in conjunction with federal and state agencies, have purchased and provided scholar's workstations and network access.[27] He highlights the point that, as a result of the creation of the networking and all the support efforts made by universities and funding agencies, scholars have grown 'accustomed' to using electronic communication. This is in line with what was found in this present study. In fact, funding agencies constitute nowadays the main source of funding for technology in most of the public higher education institutions in Brazil. They are also sometimes funding computers for individual researchers for them to have at home. Furthermore, they have been giving priority to research projects that involve acquiring technology. Apart from that, funding agencies also expect researchers to communicate with them electronically. Any research proposal, or research report, researcher's CV, etc., must be submitted in electronic format. This has brought about strong pressure for use.

Data from the questionnaires show that the majority of respondents agree that there is an expectation from funding agencies for researchers to increase the number of research projects which involve the use of IT. There are differences between economists and sociologists in this matter: sociologists agreed more with this point and some of those interviewed reported how they felt about it. A few sociologists criticised the situation because they felt that the way in which they communicate is being controlled.

In summary, financial issues relating to the introduction of new information technologies into the academic environment plus free access to electronic networks can be interpreted as economic pressures upon researchers requiring them to use these technologies. The pressures are clearly perceived by researchers who work in such an environment, and are interpreted as financial encouragement.

7.4.3 Perceptions of political pressures

The issue of political pressure is closely related to the economic (financial) one. Thus, comments already made on economic pressures apply, to some extent, to the political

ones. According to the data from the questionnaire, a larger percentage of sociologists agree that their area has not benefited from either governmental or institutional policies. Conversely, a larger percentage of economists disagree with this, perhaps because economists have benefited more from funding policies.

Data from the interviews looked at the level of awareness of these policies, but indicated no differences between the two communities of researchers. Both economists and sociologists are aware of governmental and institutional policies relating to IT and the majority of them highlighted positive aspects.

In governmental terms, one important policy mentioned concerns the decision to launch the National Research Network Programme (RNP) in 1989 and, more recently, the RNP2. This is concerned with the establishment of the Internet2 in the country, in the same way as has been done in the USA and Europe. Alongside the RNP, the end of the protection mechanism of the national informatics industry, mentioned in chapter two, was also seen as a positive policy, though there were some criticisms regarding fiscal policies for importation. Another positive policy is related to the availability of data from governmental institutions in electronic format, which is bringing about important changes in the communication flow. When these data were previously available in print form only, personal contacts via telephone and fax used to be the mechanisms adopted to overcome the delay of the printed media for those interested in faster access. Economists, to whom currency of data is essential, emphasised the importance of this aspect. Moreover, making these data available in electronic format, especially on the Internet, democratises access.

In institutional terms, there was a positive assessment of the initiatives for making technology increasingly available. In fact, the policy in every university is towards provision of networked computers for all researchers. Perceptions of the researchers interviewed provided some evidence for this, since most of the comments supported this tendency. These perceptions also confirm what Richardson predicted in the late 1980s -that computer-mediated communication would soon be commonplace in organisations which have significant numbers of knowledge workers as members, such as higher education institutions.[(28)]

7.4.4 Summary

Social pressures, such as expectations from colleagues, are clearly perceived by researchers, and the existence of such pressures can find support in the literature. The concept of economic pressures drawn from the researchers' perceptions emphasises encouragement to use, and this point has not been explored extensively in previous research findings. Nevertheless, as pointed out by Meadows, the way electronic communication affects the community "depends on the pressures, especially the economic pressures, at work."[(29)] In this sense, he highlights that researchers from developing countries who gain network access find themselves better integrated into the world-wide scholarly community. This is precisely what has been found in this research, since, maybe surprisingly, researchers from Brazil, having increasingly gained network access, now feel themselves integrated into a world-wide community, yet this 'gain' also means pressure to use. Political pressures, as indicated in the interviews, concern awareness of governmental and institutional policies that have affected the availability of technology, and so also relate to pressure to use the technology. Interpreted in this sense, political pressures were identified amongst academic researchers in institutional terms only. In governmental terms, differences in governmental regime and methods of funding between the UK and Brazil influenced the differences found in the researchers' perceptions, as would be expected.

7.5 Individual factors: perceived impacts

7.5.1 Differences in gender

Previous studies of the use of information technologies by academics have found differences in terms of demographic characteristics (see, for example, Cohen's findings described in chapter three). Age, gender and seniority appear to be the commonest factors influencing individual differences, as discussed in chapter four. With a few exceptions as regards gender, the results from this present study do not indicate that the demographic characteristics of respondents (namely age, gender, seniority and mobility) affect the use of IT for communication purposes. This suggests that the use of IT has increasingly become ubiquitous amongst academic

researchers, not least because of pressures upon them to interact with these resources within their scholarly communities.

Data from the questionnaires revealed a few relationships between gender and the frequency of use of traditional and electronic resources. The resources with which gender correlates have been described in chapter five. In all instances, males are using the resources more than females. These correlations, however, do not provide a conclusive picture of this issue, since no trends can be observed relating to, for example, a higher use of either electronic or print-related resources.

7.5.2 Impact on productivity

Amongst other issues discussed by Meadows in relation to the impact of new technologies on research activities,[30] two points were selected to provide the baseline for the discussion of perceived impact of the use of IT on productivity amongst economists and sociologists in Brazil and the UK. Firstly, Meadows observes that since a prime requirement of computers and networks is that they should handle increasingly large amounts of information, it might be supposed that their use would lead to greater productivity in terms of volume of material produced. Secondly, he observes that "it is clear that access to networks encourages teamwork; the ability for everyone to access the same data and to interact easily in their use aids joint endeavour." How the results obtained from the interview reflect on these assertions is discussed below.

Firstly, in terms of impact on the researcher's productivity, the majority of interviewees commented that interactions with computers and networks, especially the Internet, have helped both increase (in terms of volume of publications) and improve (in terms of producing a text) their productivity. The main reason for this, according to them, is greater and faster information access and better facilities for text preparation. A broad view of this is obtained from the questionnaire data. In terms of their own expectations, the large majority of respondents in both communities agreed that the use of IT helps increase publications, improve quality of work, do more work in less time, and makes it easier to find relevant information. As already discussed in chapter three, empirical evidence for the impact of the use of IT on researchers'

productivity has been found in some previous studies carried out amongst academics from different disciplines, mainly in the USA.

Handling information can have different connotations, depending on the discipline. In social sciences, particularly in economics and sociology, there is a heavy use of economic and social data whose handling involves basically statistical procedures. As observed before, there has been an increasing availability of information needed by these scholars in electronic format. Greater information access combined with the provision of electronic resources to handle this information might lead to both increasing and improving final research products. The use of electronic communication has also offered significant potential to enhance interactions with colleagues and this leads to the second point observed by Meadows -that of collaborative work.

In terms of collaborative work, results of this present study, both from the questionnaire and interviews, confirm previous findings in other disciplines and in different countries reported in chapter three. According to the data gathered from the questionnaire, the majority of scholars, both in economics and sociology, agreed with the statement that 'the use of IT makes collaborative work easier', with a significantly larger percentage of economists doing so. In terms of the interview data, the majority of economists in the UK (86 percent) reported collaborative work via electronic communication with colleagues geographically distant, whereas, surprisingly, no sociologists reported any collaborative work due to the use of networks. It is worth remembering, however, that, in the UK, this question came in the context of other questions about the use of networks. In Brazil, where this question was directly posed to interviewees, 50 percent of them in both communities reported collaborative work with colleagues geographically distant via the use of networks. Such collaborative work is concerned with working with colleagues to carry out research, write journal articles or book chapters, organise entire books, organise events, etc. It is interesting to note that it has been observed that social scientists work less collaboratively than scientists do, but more collaboratively than humanists do.(31) Within the social sciences, co-authorship was found to be higher in sociology than in economics in the early 1970s.(32) Nevertheless, changes in technology have brought about differences in collaboration between researchers. As revealed by the current study, the use of

networks has increasingly encouraged collaborative work amongst researchers in the social sciences, particularly in economics. These results confirm previous findings reported in the literature. As reported in chapter three, the major finding of a study carried out in one Israeli university in 1995 showed that academics from different divisions of knowledge considered that "the primary influence of Internet use has been on increasing co-operation with colleagues."[33] Similar results have been found in other countries[34,35,36] and help confirm this tendency.

Productivity is concerned with quantity. Qualitative aspects of the work of scholars have been highlighted in this discussion of productivity in relation to the quality of the technical aspects of the final product. As regards the quality of the researcher's work itself, the focus is on the impact on creativity and this is presented below.

7.5.3 Impact on creativity

Differences were found between economists and sociologists in terms of perceptions of the impact of the use of IT on creativity. Data from the interviews showed that there were more economists (81.3 percent) than sociologists (40 percent) in Brazil agreeing that the use of IT can have an effect on their creativity. With regard to the questionnaire data, the statement 'I expect the use of new information technologies to help improve my creativity' received the lowest level of agreement (50.2 percent of economists and 45.5 percent of sociologists), as well as the highest level of disagreement (17.1 percent of economists and 26.1 percent of sociologists) in the question concerned with researcher's own expectations of IT use. According to the comments from the interviews, the ideas underlying such a relationship do not relate to a direct effect of the technology itself on creativity, but rather some of the results from interactions with it. Le Coadic, who discusses the relationship between technology and creativity gains, advocates that it is only with more intelligent information technologies that we can expect creativity gains.[37] He observes that, in accelerating the location and ordering of information, IT can offer only productivity gains. Nevertheless, amongst those interviewees who considered that there is an effect, the commonest factor reported relates to more access to information. As electronic media facilitate access to a diversified and large amount of information, there is more opportunity to identify new ideas to build upon. Garvey observes that

"an original contribution is not creative in the sense that it is wholly different from and unrelated to anything else. More so than any other form of human creativity, scientific progress relates to, builds upon, extends, and revises existing knowledge."[38] This seems to be the idea that underlies the perceptions of the majority of interviewees who agreed that the use of IT has an effect on their creativity.

The effects of computer usage on the researcher's creativity were assessed previously in a nation-wide survey of scholars in the USA between 1985 and 1986.[39] The study included scholars from linguistics, classics, history, philosophy, political science and sociology and assessed the effects of computer usage on productivity and creativity, amongst other issues. It was reported that results for creativity were more modest than for productivity, but still substantial, though they varied by discipline. Sociologists constituted the group with the highest percentage who credited computers with improving their research creativity. The authors suggest a direct relationship between the use of computers and creativity gains. Accordingly, they interpret the results in the sense that computers make it possible to explore large data sets in new ways, and sociologists reported much greater reliance on statistical analysis. As reported in chapter three, Crawford found similar results relating to creativity and connectivity.[40]

Economists rely even more than sociologists on statistical analysis and sometimes make more sophisticated use of statistical procedures, depending on the specialism. Therefore, an additional interpretation of the results obtained in this current study, especially from the questionnaire, could possibly be that computers help handle large amounts of data as suggested by the ACLS survey of scholars, and this involves a direct relationship between the use of IT and creativity gains as proposed by Le Coadic.

7.5.4 Impact on motivation

According to a large majority of interviewees both in economics and sociology in Brazil, the availability of IT has led to more desire for communicating research within the scholarly community. Since the use of networks has diminished the communication barrier, information exchange with peers has been increasingly stimulated. Comments from the interviews referred to informal communication in

terms of contacts with colleagues, revealing a greater dynamism in interactions motivated by the availability of technology. As one economist pointed out, 'the greater the facility, the better the contact.' These findings are in accordance with what was found in the questionnaire survey, which measured factors that have driven researchers to publish over the last five years. The two major factors reported were self-motivation and recognition by peers. Self-motivation is far and away the most important factor and relates immediately to the desire to communicate. Recognition by peers is similarly directly concerned with better contacts. Factors relating to career prospects, such as the university reward system and CAPES's evaluation, appeared to be of secondary importance: this may be due to the seniority of the population investigated.

The importance given to interaction with peers via disseminating results formally was also identified in a survey of authors from sciences, arts and humanities carried out in the UK in 1998 and commented on before.[41] A number of authors have pointed out that the major and most obvious reason for authors to publish is to disseminate results to peers. This was indeed the main motivation reported by the authors surveyed in the UK. This result is in line with another survey, also carried out in the UK, amongst researchers in science, technology and medicine.[42] All these results confirm that communication with peers constitutes an important reason for disseminating research. Given that the availability of IT already increases the willingness to communicate with peers informally, as suggested by this current study, effects on formal communication may only be a question of time.

7.6 Perceived impact on the scholarly community

As suggested before, the most common elements comprising the concept of community in the sociological approach are area (or space), social interactions and common ties or bonds. The perceived impacts of the use of IT for communication purposes on the scholarly communities of economists and sociologists mainly relate to social interactions and the spatial dimension.

7.6.1 Impact on interactions within the community

According to a large majority of economists and sociologists interviewed both in Brazil and the UK, there have been significant changes in social interactions within their scholarly communities as a result of the use of electronic communication. These changes have mostly been perceived in relation to:

- Greater dynamism in informal contacts due to the ubiquitous use of e-mail, which has made communication easier and faster.

- More frequent contacts, with a growing tendency to broaden and intensify them.

- Greater facility in the exchange of information, especially at an international level.

- More opportunity to increase inter-institutional projects and to carry out collaborative work at large distances.

7.6.2 Impact on community boundaries

In terms of a researcher's own expectations, the large majority of respondents to the questionnaire agreed that they expect the use of IT to widen their scholarly community (86.1 percent of economists and 85.1 percent of sociologists). Comments from the interviews cast more light on this. Although the scholarly community of peers working in the same specialism has always been potentially international, it is the facility of contacting people brought about by global networks that has made the interactions at this level more real. The possibility of making contact easily and quickly with a larger number of colleagues, wherever they are, has been one of the most important impacts of electronic communication on the scholarly community. This widening process was testified to by almost everyone amongst the interviewees.

These findings relating to changes in the community have also been noted by Budd and Connaway.[43] The majority (nearly 60 percent) of their respondents agreed that they have noticed changes in their scholarly communities as a result of the use of electronic networks. It was also reported by 47 percent of the respondents that their

communities have expanded geographically. Some remarked that they had much better and regular contacts with colleagues from different countries and this had had substantial effects on collaborative work.

7.7 Perceived impact on the scholarly communication process

7.7.1 Printed versus electronic media: substitution or complement?

As discussed in chapter three, the shift from print to electronic communication systems has been analysed by Hurd, using the Garvey and Griffith model of the scholarly communication system as a starting point from which changes can be observed.(44) Based on recent changes in the use of technology by scientists, the author proposes a model that depicts an entirely electronic communication system. However, she highlights that at present, the electronic system co-exists with the paper-based communication system. The co-existence of these media can also be observed in this study. The majority of the interviewees, both in Brazil and the UK considered that electronic media constitute for the moment, and for the near future, a complement for printed media. Besides that, amongst those who considered that the electronic media could substitute for print, examples of such a replacement were mostly based on a 'hybrid' environment. Differences relating to each stage within the communication process have been found, and are discussed below in the sequential order in which they normally occur.

Firstly, in the initial stages, where informal contacts are prominent, significant changes are perceived. E-mail, which has been so recently introduced to the academic environment, has become a well-established resource used by researchers to communicate informally.

Secondly, significant changes have also been perceived in relation to manuscript preparation and submission. The majority of interviewees perceive that the use of IT greatly assists in manuscript preparation. Tasks like preparing a text, compiling data, doing calculations, exchanging drafts for discussion with colleagues, etc., are viewed as already gradually and irreversibly being replaced by electronic media. Submitting electronic versions of journal articles has also become a commonplace according to

the majority of interviewees, who commented that journal publishers nowadays expect authors to submit their texts in electronic format. Some who are journal editors in Brazil commented that 'their' journals only accept articles in electronic format. One economist commented on editing his last (printed) book entirely via electronic media in his own department.

These results are consistent with results from previous studies carried out amongst different communities of scholars. Schauder, found 88 percent users of word processors in his study in 1992.[45] McKnight found almost all respondents using word processors in the UK in 1998.[46] Hurd et al in their analysis of the shift from a print-related to an electronic system amongst scientists comment that individuals with access to a computer have shown an almost universally rapid acceptance of word processing for manuscript preparation.[47] Cohen, whose study was carried out in the autumn of 1994 in the USA, points out that academics increasingly discuss and submit manuscripts to journal editors via electronic media.[48] This stage comprising manuscript preparation seems to constitute a case of substitution.

Thirdly, there is the peer review process. Only a few comments were made regarding peer review as electronically assisted. Apart from abbreviating the publication process via reducing the time between printing, photocopying, mailing, etc., no other trends were either perceived or foreseen by interviewees either in Brazil or the UK. So far, these scholars expect electronic journals to involve the traditional peer review process. At most, the exchange of files between authors, publishers and referees is considered as being replaced by electronic media. Results from the questionnaire showed that the majority of respondents in Brazil, especially economists, agree that the use of IT reduces the time spent in the peer review process, and the perceptions gathered through the interviews illustrate in what sense. These aspects are also noted in the analysis presented by Hurd et al. The authors call attention to the fact that, even if the editorial peer review remains virtually unchanged, advantages from an electronic environment would include eliminating the time and expense of photocopying and mailing, and shortening the time between research results and publication. Delay is one of the most critical aspects of the publication system in social sciences, as observed by Garvey in his study of communication in the physical

and social sciences.[49] The use of electronic media to decrease this time lag represents a significant contribution to the system.

Finally, there is the publication of the product itself. Comments here concentrated mainly on books and journals as the final outlet for research communication. The former constitute a case where entire substitution is far from being accepted. The scholars interviewed were unanimous in not accepting the idea of the electronic book. In relation to journals, although a number of interviewees considered that electronic journals could replace the printed ones, the issue regarding the prestige of these sources still concerns them. A comparison of expectations regarding the acceptance of print and electronic journals amongst academic staff in biology, chemistry, physics and library and information science in the UK in 1996 showed that printed journals received 82 percent of responses relating to prestige whereas the electronic ones received 0.8 percent.[50] Similar results (high prestige of printed journals versus low prestige of the electronic ones) were obtained in the USA in 1995 amongst researchers in chemistry, physics, sociology, psychology, history and English.[51] This may relate to what has already been considered in this chapter: researchers in different fields still prefer the familiar and well-established information sources within the scholarly community. This was indeed the first result in the report of a nation-wide survey amongst researchers in science, technology and engineering at the beginning of the 1990s in the UK.[52] Similar results were found in a nation-wide survey of academics from business schools in the USA in 1994[53] and in a nation-wide survey of authors in the UK in 1998.[54]

Another aspect that arose from the responses relates to the ergonomic aspects of the electronic medium. The rejection of reading from a screen appears to be strongly influencing the use of electronic formal sources. The majority of interviewees commented that they need to print the information out to be able to read it. Similar results were found in Schauder's survey amongst academics in the USA, Australia and the UK, with 75 percent of respondents preferring to read articles received in electronic form as printouts, rather than on screen.[55] Budd and Connaway found a similar percentage of their total sample (circa 22 percent) saying that they read the contents of electronic journals on the computer screen.[56] This is related to the difficulty in absorbing large amounts of information from the computer screen, and

this sort of problem might possibly be overcome only by a new generation, who has grown up with this technology. Improvements that are increasingly being made in screen design may also contribute to a change in the near future.

In summary, a paradigm shift is taking place in the scholarly communication system in which social scientists operate as a result of the increasing use of information technologies. Nevertheless, changes that appear in the communication process itself do not occur to the same extent at the different stages of the process (in terms of either substituting or complementing traditional resources). On the informal side, electronic media are becoming highly important for the large majority of social scientists in economics and sociology both in Brazil and the UK. For formal aspects of the process, especially relating to the final product, the electronic medium has become a complement, but may gradually substitute for the printed journal -but not the book- in a near future. The electronic journal has been considered a solution to a number of issues. One of them is the diffusion of ideas in small scholarly communities. Experiences reported by some Brazilian interviewees about their departments publishing electronic journals are a good illustration of this.

7.7.2 Parallel publishing: a new model for research communication

So far, according to what has been reported in the literature, an entirely electronic communication system that can be considered as substituting for the print-based system, does not exist. The percentage of electronic outlets in the social sciences, especially journals and books, remains small as compared to the printed ones. In a continuum ranging from the most informal to the most formal aspects of the communication process, the substitution process decreases. Conversely, the complementary aspects increase. The complementary aspects observed in terms of publishing formal information sources lead to a parallel publishing model, as reported in chapter three. As a result, the dissemination process entirely based on the printed media, depicted in the Garvey and Griffith's original model, no longer exists. On the other hand, the one proposed by Hurd, entirely based on the electronic media, does not depict the interactions within the communication system as they currently occur. The co-existence of the two media, as pointed out by Hurd herself, is obvious in this present study, and leads to the proposal of a hybrid communication system in which

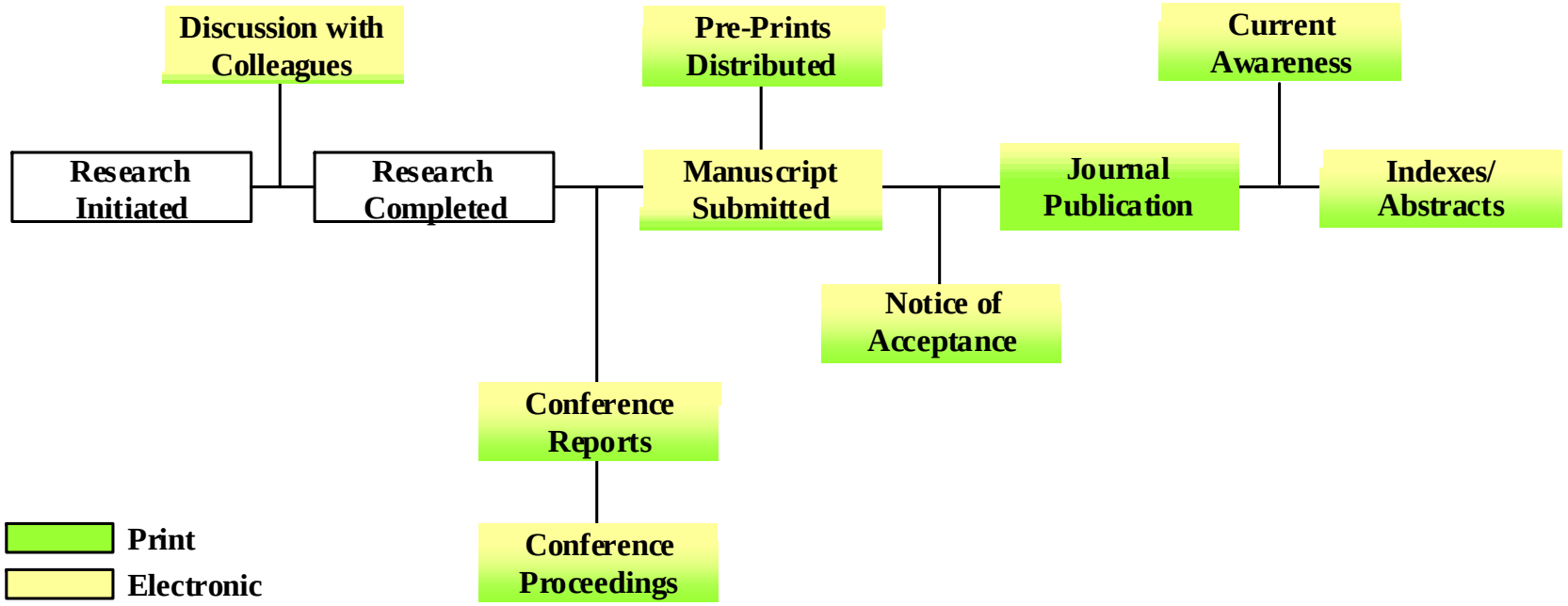

Figure 7.1

Proposed adaptation of Garvey and Griffith's model of scholarly communication for a print plus electronic environment

such a parallel publishing model can be depicted. Figure 7.1 illustrate this model, which represents the co-existence of the printed and the electronic media, as currently perceived by social scientists in Brazil and the UK.

7.8 Comparisons between Brazil and the UK

7.8.1 Social pressures

There are no differences between the perceptions of Brazilian and British researchers regarding expectations from colleagues for them to use electronic communication informally. Researchers from both countries made similar comments. In terms of formal communication, researchers in the UK feel under much less pressure regarding expectation for using electronic journals than researchers in Brazil. Only one researcher in the UK said he was feeling this sort of pressure, whereas, in Brazil, about 50 percent felt under pressure. This difference may be related to the way the question was posed. In the UK, researchers were asked mainly about publishing in these sources, whereas, in Brazil, they were asked mainly about reading them. The difference between publishing and reading reflects other issues concerning electronic journals, such as their status and recognition, and the guarantee of peer review.

Because the acceptance of electronic publications by both colleagues and assessment bodies has not yet been clearly perceived, there is still some reluctance to publish them. McKnight and Price's survey of authors in the UK investigated their reasons for not publishing in electronic journals.[57] The most frequent reason identified was lack of awareness of these sources in their fields, followed by perceived low status. Similar results were found in Tomney and Burton's study.[58] Other studies such as Gomes and Meadows,[59] as well as Budd and Connaway's[60] survey, highlight the same issues, i.e., electronic journals have not yet achieved a status that makes researchers in a field like the social sciences feel under pressure to use them.

7.8.2 Economic pressures

Researchers from both countries perceive that economic issues are likely to affect the use of IT in a university environment, but they see this as positive. However, there is

a difference in the emphasis here. In the UK, the financial issues discussed were more related to free network access and less concerned with computer provision. Conversely, in Brazil there was a higher emphasis on the provision of computers, than on free network access. In this regard, the role played by funding agencies strongly emphasised in this study in Brazil, has not been important for British researchers, perhaps because universities in the UK can afford technology for researchers from their own budgets.

7.8.3 Political pressures

This is an issue where there are differences between the two countries. There is no knowledge of governmental policies relating to IT in university environments amongst researchers in the UK, whereas, in Brazil, the majority of researchers is aware and recognises the importance of such policies for the availability and use of technology in universities. This may be related to the way plans, actions and public control are exercised in the two countries. As a developing country, there have long been centralised and highly interventionist governmental policies in every sector in Brazil, as described in chapter two. Since in the UK universities are autonomous, government plans and actions do not have a direct effect on them. In institutional terms, however, there is an agreement between the researchers' perceptions in the two countries, with recognition that university policies have a strong influence on the availability and use of technology.

7.8.4 Changes in the scholarly community

The use of networks has had a significant impact on the scholarly communities of economists and sociologists, both in Brazil and the UK. No differences were found in the perceptions of changes that have occurred in the scholarly communities of economists and sociologists as a result of the use of IT for communicating with colleagues. Researchers from both countries commented on the expansion of community boundaries, as well as the increase in the dynamism of interactions within the community. Both time and space barriers have been overcome by the use of electronic networks for communication with peers. There have increasingly been new

opportunities for contacting and working collaboratively with colleagues at large distances. Very similar experiences in terms of collaboration were reported.

7.8.5 Impact on the scholarly communication process

Issues concerning possible changes in the scholarly communication process itself were discussed in the interviews in terms of the possibility of electronic media either substituting for, or complementing print at any stage of the process. As stated before, no differences were found between Brazilian and British researchers in their perceptions of this matter. Researchers from both countries agreed on the complementary aspects of these media and on their co-existence for some time to come.

7.8.6 Impact on productivity

No major differences were found between the Brazilian and British researchers' perceptions of the impact of the use of IT on productivity. However, amongst the sociologists, while Brazilian researchers agreed that the use of IT both increases and improves productivity, the British researchers considered that it mainly improves it. Nevertheless, the aspects commented on were basically the same, and results from both countries are similar. In other words, the majority of researchers from both communities in both countries perceive that the use of IT has an impact on their productivity.

7.8.7 Impact on creativity

No differences were found between Brazilian and British researchers' perceptions of the impact of the use of IT on creativity. The same pattern of responses was obtained, with more economists than sociologists considering that the use of IT improves their creativity in both countries.

7.8.8 Impact on motivation

No differences were found in the pattern of responses obtained from both British and Brazilian researchers in terms of the impact of IT use on their motivation to communicate. The majority of interviewees in both communities from both countries considered that the availability of computers and networks makes a difference to their willingness to communicate with colleagues, in the sense that it facilitates communication and overcomes barriers.

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CHAPTER EIGHT

CONCLUSIONS

8.1 Appropriateness of the methodology adopted

The conceptual model used in this study to examine the impact of the use of IT on research communication amongst social scientists provided a useful theoretical framework through which the relationships investigated could be analysed and discussed. According to the results of the survey, the relationships depicted in the model satisfactorily represent the situation found. The approaches used helped focus on the relevant phenomena for at least two main reasons. Firstly, the social anthropology approach to communities helped to concentrate the focus on interactions within the community. This proved to be a relevant phenomenon to investigate in the context of changes in the scholarly communication system. Secondly, the system approach contributed to understanding how the relationships occur amongst the elements chosen for investigation and how they can be studied. The complementary picture resulting from the use of these two approaches led to a richer design for the study. The research design adopted in order to fulfil the aims and objectives (see pages 6 and 7) consisted of a balanced use of quantitative and qualitative approaches which seemed appropriate to tackle the problem under investigation. The methods of investigation suggested by the relationships involved, namely interviews and questionnaires, were sufficient for the study and relevant to obtain the respondents' perceptions of the problem.

As discussed in chapter four, the theory embedded in the research model states that the pressures that accompany the introduction of IT into a university environment are significant factors in the use of such technologies. These pressures produce differences in the communication process itself. Although differences already exist in

the print environment, they may be affected by electronic communication. Such differences are related to scholar's interactions within the scholarly community both informally and formally, through information resources accessed. Furthermore, there may also be a relationship between individual factors and the use of IT for communication.

An initial summary of what has been found in this study illustrates the usefulness of this theory. According to the results obtained, the concept of pressure is clearly perceived by the researchers in economics and sociology who were surveyed. Besides that, the majority acknowledged the relationship between the pressures that are being exerted upon them and the use of IT, particularly in terms of informal communication. In this sense, major impacts are perceived on the interactions with peers within the scholarly community. These changes relate to more dynamic interactions and to expansion in the community boundaries.

With regard to the interactions with information resources, according to the results obtained in this study there has been a gradual increase in the use of electronic resources, though with continuing use of traditional resources. The scholarly communication process as a whole, looked at from the most informal to the most formal aspects, has become a hybrid process in which the co-existence of both traditional and electronic resources can be observed. On the one hand, in its informal aspects, from the initial discussions with colleagues, through the preparation of a text, to its submission to a publisher, electronic resources have already become prevalent. On the other hand, in the formal aspects, particularly in relation to the final product, there still is a preference for traditional, prestigious, well-established and familiar resources such as printed journals and books. Nevertheless, as electronic journals become available, they can become as acceptable as their printed counterparts, so long as they involve the peer review process and are recognised by assessment bodies in universities and funding agencies.

In relation to individual factors, more and faster access to information resources through the use of electronic media has brought about differences in productivity, creativity and motivation for communication. Each of these issues is presented below,

as a conclusion of the study and according to the hypotheses proposed in chapter one, which state the relationships depicted in the research model.

8.2 Patterns of use of information resources

The first objective that was proposed for this study was to explore patterns of use of information resources by academic economists and sociologists in Brazil. It was hypothesised that there are differences in these patterns between economists and sociologists.

According to the results presented in chapter five and discussed in chapter seven, it can be concluded that there are, indeed, differences between economists and sociologists in relation to the patterns of use of information resources. Economists seemed to be more technologically oriented than sociologists when communicating research in an academic environment. This can be related to the position of the subjects in a continuum that ranges from the hardest to the softest disciplines, as well as from the highest to the lowest adopters of technology. Economists are likely to lie at the harder border of the social sciences division, as compared to sociologists, who lie in the middle. This result reflects the influence of the subject on the communication patterns of researchers, and adds to the discussion of this issue within the existing body of knowledge in information science.

The hypothesis was therefore supported by the results obtained in this study: there are differences in the patterns of use of information resources by economists and sociologists.

8.3 Relationships between environmental factors and the use of IT

The second objective of this study was to explore environmental factors which might influence differences and similarities in the use of computers and networks by economists and sociologists for research communication purposes. It was hypothesised that environmental factors, such as social, economic and political pressures, influence the use of computers and networks by academic economists and sociologists for communicating research in Brazil. The results obtained are described

in chapter six and discussed in chapter seven. It can be concluded that the concept of pressure, which accompanies the introduction of IT into the academic environment in which the scholarly communication system operates, is clearly perceived by economists and sociologists. The three aspects of the concept -namely, social, economic and political pressure- were recognised by the large majority of researchers in both communities. These pressures were considered as strongly influencing the use of computers and networks for discussing research with colleagues, bringing about differences in the scholarly communication process itself.

♦ Social pressures represent a direct impact, since they are exerted by colleagues within the scholarly community, therefore involving a direct relationship. They were acknowledged as one factor that has increasingly influenced the use of IT. Informal communication provides the interactions where this impact is mostly perceived. The introduction of e-mail as a facility used for contacting colleagues, wherever they are, represents a major factor of change in these interactions. Formal communication relating to the use of electronic journals does not yet represent a major factor.

♦ Economic pressures represent an indirect impact. They are exerted by the provision of funding for technology acquisition and accessibility, which is accompanied by the expectation for researchers to use it. Economic pressures are exerted by both universities and funding agencies in Brazil. However, the major agents of these pressures in the country are funding agencies, though they represent an external element of the scholarly communication system. Expectations from funding agencies for researchers to increase the number of research projects involving the use of IT and also to communicate with them electronically represent pressures for these researchers to use this technology. Therefore, funding agencies play an influential role in the interactions within the scholarly community. This is seen in the increasing use of computers and networks, and the consequent changes in the scholarly communication process, as these functions become increasingly technologically assisted. The pressures are exerted in terms of encouragement to use the technology made available.

♦ Political pressures also represent an indirect impact. They are exerted by both the government and the universities, through decisions relating to the provision of

technology. In this sense, political pressures are closed related to financial issues. A positive assessment of both institutional and governmental policies was found amongst Brazilian researchers in both communities, and the pressures in this case also represent encouragement to use the technology. Perceptions of political pressures relate to the governmental and institutional administrative models adopted in the country.

The hypothesis concerning the influence of environmental factors on the use of IT has therefore been supported by the results obtained in this study.

8.4 Relationships between individual factors and the use of IT

The third objective of this study was to explore individual factors that might influence differences and similarities between academic social scientists in the use of computers and networks for communication purposes. It was hypothesised that individual factors such as age, gender, mobility and seniority can affect the use of computers by academic economists and sociologists, and this, in turn, can affect researcher's productivity, creativity and motivation.

This study failed to find any relationship between most of the demographic characteristics of academic researchers in the social sciences and the use of IT for communication purposes. No evidence of the relationship between such variables namely age, seniority and mobility and the use of information resources was found in the population investigated. However, a small number of relationships were found in terms of gender. Significant results were obtained regarding perceptions of the influence of IT usage on researchers' productivity, creativity and motivation, as described in chapter six and discussed in chapter seven. The conclusions from these results are as follows.

♦ In terms of perceptions of the impact on productivity, it can be concluded that the use of IT has helped both increase and improve productivity. It helps increase researcher's publications and improves the quality of the text itself. These two benefits are related to changes in access to information yielded by the introduction of computers and networks, which have made this access greater in volume, faster and

more efficient. From the respondents' point of view, the greater and faster the interaction with information resources, the greater their productivity.

♦ With regard to perceptions of the impact on creativity, differences were found between the two communities studied. Economists acknowledged the influence of the use of IT on their creativity more than sociologists did. The influence of the use of computers and networks on creativity is also perceived as being related to more access to information. Interactions with more and diversified information are facilitated by the use of electronic media, which provide increased opportunities to come across new ideas, and this benefits creativity.

♦ With reference to perceptions of the impact on motivation, broad agreement was found amongst both economists and sociologists that the accessibility of electronic media leads to more desire to communicate. Furthermore, self-motivation was, by and large, the most important factor reported as driving economists and sociologists in Brazil to publicise their research findings. It can therefore be concluded that, according to the perceptions obtained from this study, accessibility to electronic media has an influence on researchers' desire to disseminate results to their peers. Recognition from peers constituted the second most important factor driving these researchers to publish.

The theoretical framework defined for this study states that the concept of access underlies the approach to information resources as part of the environmental factors studied. According to the results obtained, the key factor affecting the relationship between the use of IT and individual characteristics, such as productivity, creativity and motivation, is more access to information sources and services (in terms of productivity and creativity) and more access to equipment and facilities (in terms of motivation). Therefore, the conclusion is that the use of IT for communication purposes has an effect on individual characteristics such as productivity, creativity and motivation. As demographic characteristics did not, in general, relate to the use of IT in this study, the hypothesis on the relationship between individual characteristics and the use of IT was only partially supported.

8.5 Changes in the scholarly community

The fourth objective of this study was to identify differences and similarities in the interactions within the scholarly communities of economists and sociologists as a result of the use of electronic media for communicating research in Brazil. It was hypothesised that the use of computers and networks by academic economists and sociologists for communicating research can affect the scholarly communication process in terms of changes in the interactions within the scholarly community.

One of the major impacts of the use of electronic communication identified in this study was on the interactions within the scholarly community. The dynamic process of contact with colleagues has greatly improved, particularly because of the speed of the interactions. Moreover, these contacts are increasingly taking place at an international level. In this sense, there is a very common perception of the expansion of the community boundaries. Although there have always been researchers working on similar topics in different countries around the world, the introduction of electronic networks into the academic environment has made them more 'connected'. One of the most widely perceived consequences of these interactions is an increase in collaborative work amongst colleagues who are geographically distant. Therefore, the hypothesis relating to changes in the scholarly community was supported.

8.6 Changes in the scholarly communication process

The scholarly communication process was approached in this study as a human activity system where interactions involving its most important element, the scholar, are sensitive to the influence of environmental factors, such as social, economic and political pressures. These pressures can have an influence on interactions with both colleagues and information resources, which, in turn, leads to changes in the process itself. The fifth objective of this study was to identify changes that may be occurring in the scholarly communication process as a result of the use of IT. It was hypothesised that computer usage by academic economists and sociologists for communicating research can affect the scholarly communication process in terms of changes in its dynamics.

One of the main changes perceived in the process itself as a result of the use of computers and networks for communication was increased speed in both the production (generation) and dissemination stages. This study identified a common perception that the time lag between the initial idea and the appearance of the final product has diminished with the use of electronic communication. Although the ethos does not appear to have changed, since accepted norms and rules seem to remain essential parts of the system, the technical aspects have greatly benefited from the use of IT and its impact on the process.

The other major change perceived relates to the complementary aspects of print and electronic media from the most informal to the most formal domain within the communication system. Informal communication now strongly and almost universally relies on electronic media. Formal communication has experienced a gradually growing impact by electronic media on the well-established print environment. Questions concerning ergonomic aspects of computers, prestige of journals, recognition of electronic sources, and so on, play a role in determining the growing participation of the electronic media in this scenario. This complementarity has transformed the communication system into a hybrid one, with the likely co-existence of the two media for some time to come. The hypothesis on changes in the scholarly communication process as a result of the use of IT was clearly supported, according to the perceptions recorded in this study.

8.7 Comparisons between Brazil and the UK

The sixth objective of this study was to compare perceptions of the impact of the use of IT on the scholarly communication process for academic economists and sociologists in Brazil and the UK. It was hypothesised that there are differences between perceptions of the impact of the use of IT on the scholarly communication process in Brazil and the UK.

Most of the relationships proposed in this study were similarly perceived by economists and sociologists in Brazil and the UK. In terms of pressures upon researchers to communicate electronically, only a few differences were found in perceptions of social, economic and political pressures. In terms of social pressures,

the use of e-mail for discussing research with colleagues has yielded remarkable changes in informal contacts in both countries, and expectations by colleagues for researchers to use it are keenly felt. Fewer expectations were perceived in both countries, more especially in the UK, regarding expectations for the use of electronic formal sources. With regard to economic pressures, researchers from both countries acknowledged that universities have significantly invested in technology and therefore expect them to make effective use of it. The role played by funding agencies in the provision of technology to universities was strongly highlighted amongst Brazilians, but was not regarded as significant by the British researchers. As regarding political pressures in general, there is a similar recognition of university policy in making technology available and encouraging researchers to use it. In relation to governments, perceptions of Brazilian and British researchers differ and these differences relate to the governmental model existing in each country.

Similar perceptions were also found in relation to the likelihood of electronic media becoming a complement to, or substitute for, print. The complementarity of the two media was highlighted in both countries as a feature that is experienced now, and is expected to continue for the near future.

Changes in the scholarly community were similarly perceived by Brazilian and British researchers. A common perception that the use of electronic networks has increased interactions and expanded boundaries in their communities was identified. Contacts with colleagues at the international level have become common, leading to important changes in collaborative work.

Perceptions concerning the impact of the use of electronic communication on individual characteristics, such as productivity, creativity and motivation, were also similar in both countries.

Taken as a whole, the comments made during the interviews showed that both Brazilian and British social scientists have similar perceptions of the impact of the use of IT on communication. The large majority of them have been using computers and networks to communicate with colleagues around the world about research. Most of them agree that their scholarly communities are expanding because of the use of

electronic networks. Significant changes are occurring in the interactions within their communities, particularly relating to collaborative work with colleagues geographically distant.

The general conclusion drawn from these similarities is twofold. Firstly, in terms of the theory being tested, it showed that the research model adopted in the study fitted different environments well. Secondly, in terms of previous expectations about the situation in the two countries, the results obtained showed that Brazilian researchers do not lag behind the British ones. Therefore, the hypothesis on the differences between Brazil and the UK was not supported.

8.8 Differences between economists and sociologists

The main aim of this study was to see whether there are differences in the nature and pattern of computer usage for communicating research between disciplines in the social sciences in Brazil and, if so, whether they can be related to factors which can affect the process of communication. This study found more similarities than differences between economists and sociologists. There were only a few issues for which differences were found. Firstly, in relation to patterns of use of information resources, economists are using more electronic resources than sociologists. Secondly, a larger number of economists agreed that their colleagues expect them to use electronic formal sources. Thirdly, a larger percentage of sociologists (75 percent) agreed that electronic media could only complement print, whereas amongst economists only 56 percent considered the same. Finally, more economists perceived that the use of IT has an effect on their creativity. In the UK, experiences reported in this study showed that there are more economists than sociologists doing collaborative work with colleagues geographically distant through the use of electronic networks. In summary, economists appeared more technologically oriented than sociologists in this study.

It seems that it is not the differences, but the similarities found between economists and sociologists, in both Brazil and the UK, which are important. Assuming that the sample is representative of the social sciences, it can be said that:

- Environmental factors, such as social, economic and political pressures, are influencing the use of computers and networks for communicating research.

- Social scientists in Brazil and the UK feel under pressure by their colleagues to communicate electronically, particularly via e-mail.

- Informal communication is being greatly affected by the use of e-mail to contact colleagues at local, national and international level.

- The use of computers and networks is having an impact on the interactions within the scholarly communities in both Brazil and the UK, in that they are becoming increasingly dynamic.

- The use of computers and networks is increasingly making it possible to work collaboratively with colleagues geographically distant.

- The greater and faster access that is now possible because of the use of computers and networks is helping to increase researchers' productivity and creativity, as well as the desire to communicate.

- The scholarly communication process is changing as a result of the increasing penetration of electronic media into the print environment, with the gradual substitution of some resources.

- The increasing complementarity of electronic and printed media is creating a hybrid communication system, with the evolving co-existence of these media as a major feature.

8.9 Suggestions for further studies

1. Changes that have occurred in the scholarly communication process as a result of the use of IT are time-related. A gradual increase in the use of electronic resources has been observed in this study. Therefore, longitudinal studies that look at these developments at different points in time could provide further insights into impact of the use of IT by academics for communication purposes.

2. Major similarities were found in this study between economists and sociologists in terms of their perceptions of the impact of IT on the scholarly communication process. Further investigations of researchers in other disciplines within the social sciences would contribute to generalisations in this matter. For example, a comparative study of anthropologists and psychologists (who appear to lie on opposite boundaries of the social sciences), might reveal additional useful details.

3. There were some indications that regional differences in Brazil may have an influence on the current use of IT by academics. Studies that focus more deeply on these differences, carried out amongst different disciplines from the three divisions of knowledge (to allow for the influence of the subject), should reveal more details.

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APPENDIX 1

Questionnaire

THE IMPACT OF INFORMATION TECHNOLOGIES ON THE SCHOLARLY COMMUNICATION

1 For how long have you been using computers for communication purposes? Please circle the appropriate number

1 [Do not use] **2** [For less than 3 years] **3** [For 3 to 5 years] **4** [For more than 5 years]

2 How often, on average, do you use the following facilities for research communication purposes? If the heading 'Never' applies, please tick the appropriate column.

Frequency / Electronic facilities	Never		At least once a year	At least once a month	Once a week	Several times a week
	Available	Not Available				
Stand-alone computer at home						
Networked computer at home						
Stand-alone computer at work						
Networked computer on your desk						
Networked computer in other place, at work						
Fax						

Frequency / Traditional facilities	Never		At least once a year	At least once a month	Once a week	Several times a week
	Available	Not Available				
Type-writer						
Telephone						
Photocopier						
Other. Please specify.						

3 How often, on average, do you use the following facilities in connection to your research? If the heading 'Never' applies, please tick the appropriate column.

Frequency / Electronic facilities	Never		At least once a year	At least once a month	Once a week	Several times a week
	Available	Not Available				
Library web site						
Other web sites						
Discussion lists/Bulletin boards						
Other. Please specify						

Frequency / Traditional facilities	Never		At least once a year	At least once a month	Once a week	Several times a week
	Available	Not Available				
University library						
Other libraries						
Bookshops						
Publishers' catalogues						
Colleagues' archives						
Other. Please specify						

4 How often, on average, do you use the following information sources? If the heading 'Never' applies, please tick the appropriate column.

Frequency / Electronic sources	Never		At least once a year	At least once a month	Once a week	Several times a week
	Available	Not Available				
Electronic journals						
Electronic conference proceedings						
Electronic full-text databases						
On-line numerical databanks						
Other. Please specify						

Frequency / Traditional sources	Never		At least once a year	At least once a month	Once a week	Several times a week
	Available	Not Available				
Printed books						
Printed journals						
Printed conference proceedings						
Reports						
Other. Please specify						

5 How often, on average, do you use the following bibliographic services for research purposes? If the heading 'Never' applies, please tick the appropriate column.

Frequency / Electronic services	Never		At least once a year	At least once a month	Once a week	Several times a week
	Available	Not Available				
Library on-line public access catalogues						
On-line bibliographic databases						
CD-ROM bibliographic databases						
Search engines						
Personal bibliographic databases						
Other. Please specify:						

Frequency / Traditional services	Never		At least once a year	At least once a month	Once a week	Several times a week
	Available	Not Available				
Library card catalogues						
Personal card catalogue						
Printed abstracts						
Current contents						
Interlibrary loan						
Other. Please specify						

6 What is your age? Please circle the appropriate option

1	2	3	4	5
30 years or under	**31-40 years**	**41-50 years**	**51-60 years**	**61 years or over**

7 Your gender? Please circle the appropriate option

1	2
Male	**Female**

8 What is your highest academic qualification? Please circle the appropriate option

1	2	3	4	5
DSc	**PhD**	**Master**	**BSc/BA**	**Other**

9 In which of the following world regions did you obtain your highest degree?

1	2	3	4	5	6
USA	**Europe**	**Asia**	**Africa**	**Brazil**	**Latin America and Caribean**

10 For how long have you been working in your present specialism? Please circle the appropriate option

1	2	3
Up to 5 years	**5 to 10 years**	**More than 10 years**

11 How long have you been working in your present institution? Please circle the appropriate option

1	2	3	4
Less than 5 years	**5 to 10 years**	**11 to 15 years**	**More than 15 years**

12 What is your rank? Please circle the appropriate option:

1	2	3	4	5	6	7
Professor	**Reader**	**Senior lecturer**	**Lecturer**	**Research Associate**	**Research Fellow**	**Research Student**

13 What have been the most important factors driving your intention to publish over the last five years? Please rank your answers from **1** to **6**

1	**The university reward system, e.g. promotion**	**[ ]**
2	**Desire to acquire research funding**	**[ ]**
3	**The involvement in teamwork**	**[ ]**
4	**Recognition from your research community**	**[ ]**
5	**Self-motivation**	**[ ]**
6	**Other. Please specify _____**	**[ ]**

14 To what extent would you agree with the statements below? Please tick as appropriate, using the following codes

1	**2**	**3**	**4**	**5**
Strongly agree	Agree	Not sure	Disagree	Strongly disagree

Own expectations	**1**	**2**	**3**	**4**	**5**
I expect use of information technologies to increase my overall amount of informal communication over the next few years					
I expect use of information technologies to increase my number of publications over the next few years					
I expect use of computers to improve the quality of my research work over the next few years					
I expect to publish some of my research articles in refereed electronic journals over the next few years					
I expect electronic communication to widen the scholarly community with whom I am in contact over the next few years					
I expect use of computers to help me do more work in less time over the next few years					
I expect information technologies will help improve my creativity over the next few years					
I expect use of information technologies will make it easier for me to find information relevant to my research work over the next few years					
General expectations					
My colleagues from my scholarly community expect that the use of electronic networks will make it easier to work collaboratively over the next few years					
Researchers within my field expect that the use of national and international networks will yield entirely new scholarly communities over the next few years					
Authors and publishers expect that the use of electronic communication will help reduce the overall time spent in the peer review process over the next few years					
Grant-giving agencies expect an increasing in the number of research projects that are related to the use of information technologies for communication purposes					
Current government and university policies on information technology will not advantage academic researchers within my own field					

After completion please, return the questionnaire in the stamped addressed envelope provided.

THANK YOU VERY MUCH
FOR YOUR CO-OPERATION.

Sely Maria de Souza Costa
PhD Research Student
Department of Information and Library Studies
Loughborough University
Loughborough, Leics.
LE11 3TU - UK

Fax: (0044) 1509 223053
E-mail: s.m.d.s.costa@lboro.ac.uk

Dear _____
Post-graduate programme in _____
Institution: _____

18th March 1998

My name is Sely Maria de Souza Costa. I am a lecturer in the Department of Information Science and Documentation at the Universidade de Brasília. Currently, I am attending a PhD programme at Loughborough University in England. I am carrying out research on the impact of the use of information technologies on the scholarly communication process amongst academic researchers in economics and sociology in Brazil. There is an outline of the research attached to this letter, together with a definition of key terms.

I am assuming that your post-graduate programme co-ordinator, who I contacted previously, has informed you about my research. I would appreciate it very much if you could respond to the attached questionnaire in the next three weeks, and return it to my department in Brasília in the self-addressed, stamped envelope that I have provided. I would like to emphasise that I need a good response rate in order to obtain a valid amount of data for my research.

Thank you very much for your co-operation.

Yours sincerely,

Sely M. S. Costa
PhD Research Student
Department of Information and Library Studies
Loughborough University
Loughborough, Leics.

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The impact of the use of information technology on the scholarly communication process amongst social scientists in Brazil

Definitions

Research communication**:** the process through which researchers interact with colleagues and information resources, from the most informal stages such as discussing new research ideas, through the intermediary stages involving access to information, preparation of texts and dissemination of preliminary results, to the publication of the final product, such as a journal article, a book, etc.

Information technologies: computers, electronic networks and all related facilities.

The topic

This proposed study is intended to provide an in-depth investigation of the impact of the use of information technologies on the process of communicating research between academic social scientists in the field of economics and sociology in Brazil, together with some comparison with the UK.

The aim of the study

The prime aim of the study is to see whether there are differences in the patterns and processes of computer usage for communicating research between disciplines in the social sciences, and, if so, whether they can be related to factors which can affect the process of communication.

General assumptions

It has been assumed that environmental factors (such as social expectations, economic constraints/encouragement, government/institutional policies) along with individual ones (such as age, gender, mobility, productivity, creativity and motivation) may influence differences and similarities between academic economists and sociologists when they use computers and networks for the process of communicating research.

The scope of the study

Environmental and individual factors affecting, or being affected by, computer usage in the scholarly communication will be analysed in depth. The extent and patterns of computer usage will similarly be explored in the study.

The relevance of the study

There is an increasing interest in the role the new information technologies are playing in the scholarly communication process, not least as a result of the changes that have been occurring in the communication technology, itself. Studies which focus on computer-mediated communication have been carried out in increasing depth over the past decade, but with more emphasis on studies of scientists and engineers than of social scientists. It is therefore needful to carry out an examination of the attitudes of social scientists (as represented here by economists and sociologists). This is particularly important in a country such as Brazil, where a variety of pressures may lead to an under-utilisation of technological resources.

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Dear _____
Post-graduate programme in _____
Institution: _____

8th August 1998

My name is Sely M S Costa. I am doing my PhD programme at Loughborough University in England. My research is concerned with the impact of the use of information technologies on the scholarly communication process amongst academic researchers in economics and sociology in Brazil. I am sending a copy of my questionnaire to you for the **second time** and I would appreciate it very much if you could reply within the next three weeks and return it to me in the envelope that I have provided. If you have already replied, please take no notice of this letter.

It is important to emphasise that I need a good response rate in order to obtain a valid amount of data to analyse. So far, I received circa 20 percent only. Therefore I will be very grateful if you could help me and reply.

Attached you can find an outline of my research together with the definition of key terms used in the questionnaire.

Thank you very much for your valuable co-operation.

Yours sincerely,

Sely M S Costa
PhD Research Student
Department of Information and Library Studies
Loughborough University
Loughborough, Leics.
LE11 3TU

Interview schedule

General questions

- **What is your qualification?**
- **What is your exact specialism?**

A. Environment-related questions

1 Social pressures (Define 'scholarly community' first: A small number of researchers focusing on a common problem, carrying out research on the same topic, or writing papers together, wherever they may be - from the same university department to another continent).

- Do your colleagues expect you to use e-mail or discussion lists to discuss with them about your research?
- Do they expect you to read electronic journals or other electronic formal sources? When are those sources going to be as acceptable as print ones?
- Is your scholarly community changing because of the use of IT for communication purposes?

2 Economic pressures

- Are financial issues likely to affect the use of IT for communication? Example?

3 Political/Institutional pressures

- Have you any knowledge of information policies at your university, or in the government that might affect the use of IT for communicating research within your field?

4 Information resources

- In your opinion, can the use of IT for communicating research become a substitute for any print-related information resources, or will it become a complement for them? Can this use help inadequacies of the print system? How do you see this question now and in a near future?

B. Individual-related questions

1 Productivity (Define first: amount of publications produced).

- Would you agree that the use of IT may help either increase, or improve your own number of publications? Are there any changes related to collaborative work?

2 Creativity (Define first: development of new ideas for research).

- Do you think that the use of IT may have an effect on your creativity?

3 Motivation

- Do you think that the availability of IT makes any difference to your willingness to communicate?

List of programmes comprising the questionnaire sample

Economics	
Programme	**Institution**
1. Economics	Federal University of Ceará
2. Rural Economics	Federal University of Paraíba: Campina Grande
3. Economics	Federal University of Pernambuco
4. Economics	Federal University of Bahia
5. Economics of Industry and Technology	Federal University of Rio de Janeiro
6. Economics	Pontifical Catholic University: Rio de Janeiro
7. Economics	Getúlio Vargas Foundation: Rio de Janeiro
8. Economics	Federal University of Minas Gerais
9. Economic Development	Federal University of Uberlândia (Minas Gerais)
10. Economics	University of São Paulo
11. Economics	University of Campinas (São Paulo)
12. Economics	Pontifical Catholic University: São Paulo
13. Business Economics	Getúlio Vargas Foundation: São Paulo
14. Economic Development	Federal University of Paraná
15. Economics	Federal University of Santa Catarina
16. Economics	Federal University of Rio Grande do Sul
17. Economics	University of Brasília
18. Economics	Federal *Fluminense* University (Rio de Janeiro)
19. Economics	Federal University of Paraíba: João Pessoa
20. Rural Economics	Federal University of Rio Grande do Sul
21. Rural Economics	Federal University of Ceará
22. Economics	Federal University of Espírito Santo
23. Rural Economics	Federal University of Viçosa (Minas Gerais)
24. Applied Economics	University of São Paulo. Superior School of Agriculture 'Luiz de Queiroz'

List of programmes comprising the questionnaire sample

Sociology	
Programme	**Institution**
1. Development Planning	Federal University of Pará
2. Sociology	Federal University of Ceará
3. Regional Development	Federal University of Rio Grande do Norte
4. Sociology	Federal University of Paraíba: João Pessoa
5. Rural Sociology	Federal University of Paraíba: Campina Grande
6. Sociology	Federal University of Pernambuco
7. Sociology	Federal University of Bahia
8. Development, Agriculture and Society	Federal Rural University of Rio de Janeiro
9. Sociology	Research University Institute of Rio de Janeiro (IUPERJ)
10. Sociology	Federal University of Minas Gerais
11. Social Sciences	Federal University of São Carlos (São Paulo)
12. Sociology	University of São Paulo
13. Latin American Integration	University of São Paulo
14. Sociology	University of Campinas (São Paulo)
15. Sociology	São Paulo State University Júlio de Mesquita Filho: Araraquara (São Paulo)
16. Social Sciences	Pontifical Catholic University: São Paulo
17. Sociology	Federal University of Rio Grande do Sul
18. Sociology	University of Brasília
19. Sociology	Federal University of Rio de Janeiro
20. Sociology	Federal University of Paraná
21. Political Sociology	Federal University of Santa Catarina

List of Programmes comprising the interview sample
(Most productive centres)
Average annual publication rates and mean averages

Economics					
Institution	**City/State**	**1994**	**1995**	**1996**	**Mean**
Pontifical Catholic University (PUC)	Rio de Janeiro/Rio de Janeiro	9.2	10.5	24.2	**14.6**
Getúlio Vargas Foundation (FGV)	São Paulo/São Paulo	8.4	4.6	12.0	**8.3**
University of Campinas (UNICAMP)	Campinas/São Paulo	4.1	3.7	12.8	**6.9**
Federal University of Paraíba/JP (UFPB)	João Pessoa/Paraíba	4.1	4.1	12.0	**6.7**
Pontifical Catholic University (PUC)	São Paulo/São Paulo	5.9	5.1	8.9	**6.6**
Getúlio Vargas Foundation (FGV)	Rio de Janeiro/Rio de Janeiro	8.4	5.9	5.2	**6.5**
University of São Paulo (USP)	São Paulo/São Paulo	4.7	4.9	8.7	**6.1**
Federal University of Minas Gerais (UFMG)*	Belo Horizonte/Minas Gerais	2.6	3.9	3.3	**3.3**

(*) Less productive programme

List of Programmes comprising the interview sample
(Most productive centres)
Average annual publication rates and mean averages

Sociology					
Institution	**City/State**	**1994**	**1995**	**1996**	**Mean**
University of São Paulo (USP)	São Paulo/São Paulo	8.9	8,5	11.7	**9.7**
University of Campinas (UNICAMP)	Campinas/São Paulo	3.5	3.9	16.2	**7.9**
Federal University of Rio de Janeiro (UFRJ)	Rio de Janeiro/Rio de Janeiro	4.5	3.5	10.7	**6.2**
University of São Paulo (USP)	São Paulo/São Paulo	4.1	4.6	9.2	**6.0**
Federal University of Paraíba/JP (UFPB)	João Pessoa/Paraíba	3.5	3.5	9.9	**5.6**
University of Brasília	Brasília/Dsitrito Federal	4.3	4.2	5.6	**4.7**
Federal University of Pernambuco	Recife/Pernambuco	3.0	3.2	7.7	**4.6**
Federal University of Minas Gerais (UFMG)*	Belo Horizonte/Minas Gerais	2.6	2.1	4.5	**3.1**

(*) Less productive programme

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Dear _____
Post-graduate programme in _____
Institution _____

12th June 1998

My name is Sely M S Costa. As you will know from my questionnaire, I am carrying out PhD research on the impact of the use of information technologies on the scholarly communication process amongst academic researchers in economics and sociology in Brazil. The research method adopted in the investigation includes sending mail questionnaires and carrying out interviews to provide an in-depth approach to the problem being investigated.

A small number of researchers from post-graduate programmes have been selected to comprise the sample for interview, and your name is amongst those selected. The selection criterion was based on individual research productivity, according to data produced by CAPES.

I am contacting you to know whether or not you will agree to being interviewed for about 30 to 40 minutes. I will be in your city during the period between …../…../….and …../…../….. I would appreciate it very much if you could fill in the attached form with your response and return it to me in the envelope I have provided.

Thank you very much for your co-operation. I am looking forward to hearing from you.

Yours sincerely,

Sely M S Costa
PhD Research Student
Department of Information and Library Studies
Loughborough University

Loughborough, Leics. LE11 3TU - UK

Name: _____

Post-Graduate programme _____

Institution:_____

Circle the appropriate option, please, and return to me, <u>in any case</u>:

1	**I agree to being interviewed**	**Yes**	**No**
2	**I would like to receive the interview schedule in advance**	**Yes**	**No**
3	**I agree to provide my telephone number/ e-mail address for a quicker contact**	**Yes**	**No**

(If yes) **Telephone: _____**

E-mail: _____