

Chapter 1. Introduction

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When reading the accounts of the 1870s and 1880s written by those who lived through them, one is inevitably struck by the similarities between the evolution of compound engines and ships and that of chips and computers, between the process of generation of a world economy through transcontinental transport and telegraph and the present process of globalization through telecommunication and the Internet (Perez, 2002).

1.1 Background

“No topic in publishing and information has been more talked about in recent years than electronic and optical communication technology and its impact on existing media and on the future of paper” (Rennel *et al.*, 1984). This statement is the first line of a book, published over 20 years ago, that considers the impacts of information and communication technology (ICT) on the paper industry and markets.¹ Since then, the world has experienced the spread of new ICT innovations to mass markets such as the Internet, broadband, and mobile phones. While the world forest sector has also been fundamentally changed by the development of ICT, there are still no comprehensive or systematic studies as to how. Nor are there any studies as to how ICT is likely to change the sector in the future. This study aims to fill some of those gaps.

The lack of such studies is perhaps not surprising. Studying the impact of ICT on the forest sector would—in some ways—be like studying the impact of electricity or the internal combustion engine on the forest sector. ICT, like electricity and the engine, belongs to a category known as general purpose technologies: technologies that are basically everywhere and affect everything (Jovanovic and Rousseau, forthcoming). The role of ICT in the development of the forest sector is thus difficult to precisely identify and quantify. Moreover, immediate, short-term changes in general purpose technologies tend to have long-term impacts in terms of organizational, institutional, and cultural changes. Thus, the full impact of ICT will be apparent only after a long time lapse.

As the quotation at the beginning of this chapter indicates, the “ICT revolution” is often understood as having changed and as continuing to change our societies just as the “industrial revolution” did in the late nineteenth century. Today, we know that the industrial revolution caused fundamental changes in the forest sector, for example, the advent of large-scale pulp and paper manufacturing. Similarly, the forest sector has not been immune to ICT, nor will it be immune to the ICT developments predicted to take place in the future. As many of the impacts of ICT on the forest sector are very general, a precise assessment of them is difficult. It is, however, important to try to analyze them.

There are already a number of studies on particular aspects of ICT and their impact on specific forest-sector-related topics. Interest has been most significant and long-standing in the impacts of electronic media on paper consumption. There have also been studies on more contemporary issues, such as the role of global positioning systems (GPS) in forest inventory, e-business in the wood products industry, or radio frequency identification (RFID) labels in packaging, to mention a few.

This publication presents an extensive discussion of ICT impacts on the forest sector—from the forestry industry to the end products in the market. This breadth of discussion has important advantages. First, as issues in the forest sector tend to be linked, it allows useful feedback between the various topics. For example, if ICT changes the consumption of forest products (e.g., paper), there will also be changes in the consumption of wood, and thus in the way we use our forests. It is

¹ For a detailed definition of ICT, see the Appendix.

therefore useful to try to analyze how ICT impacts on forest products “trickle down” to forests. The second advantage of extensive coverage is to provide a discussion about those topics not addressed in detail in the literature. As already mentioned, the main relevance of ICT to the forest sector has historically been seen in terms of its possible impacts on paper consumption. Even today, when one discusses ICT in the context of the forest sector, people’s minds immediately turn to such issues as “the paperless office.” However, as this publication shows, this is too narrow a view. ICT has affected and is still affecting the global forest sector in many other ways, and these are fundamentally changing how things are being done or not being done anymore.

Many of the impacts of ICT on the forest sector are relatively new or still on the horizon. This is quite simply because some of the major ICT innovations tend to be of recent origin themselves. For example, in 1995, the first year of widespread use of the Internet, there were still only about 16 million users in the world. Ten years later, there are about one billion. Given the speed at which the Internet is currently spreading, there may well be two billion by 2010. More important than the number of users, of course, are the changes that such trends are bringing with them. Economic, social, political, and cultural activities across the globe are being structured by and around the Internet, computers, and mobile communication networks. Castells (2001, p. 3) has stated that, “exclusion from these networks is one of the most damaging forms of exclusion in our economy and in our culture.”

To sum up, the study rests on the view that the ICT revolution that started in the late twentieth century is causing fundamental transformations in the global forest sector and that anyone interested in knowing what is happening to the global forest sector in the coming decades also needs to be familiar with how ICT is changing our societies. The need for an analytical evaluation of the impacts of ICT on the global forest sector is thus obvious.

1.2 What Do We Wish to Accomplish?

ICT is not only about new technology; it is also about new ways of doing things. ICT can be seen as having three interlocking themes: 1) new developments in the technologies themselves, 2) new innovations, developments within organizations, and developments in sectoral working/business practices, and 3) how quickly and how widely these developments are being taken up in society. The details of the technology are less important than the changes that ICT is bringing to the basic structures of society. For example, ICT has important implications for the ways societies organize work and create economic wealth and for how people spend their leisure time. It helps to interconnect people, economies, and societies in new ways—the words *globalization* and *networking* are often used in this context. Thus, the analysis in this study emphasizes the *impacts* of ICT rather than the technology itself.

The impacts of ICT on the global forest sector can be seen in contrasting ways. For example, in countries where the forest sector has played an important role (e.g., Canada, Finland, Sweden, and parts of the United States), it is not uncommon to contrast the new “knowledge society” or “ICT society” with mature “smokestack” sectors such as the forest industry. While the former is viewed as representing the future and hope, the latter is seen as something belonging to the past, in short, *passé*. Indeed, in many of the countries just mentioned, this *passé* image is making it increasingly difficult to attract new generations to study forest-industry-related subjects or to work in the forest industry. Although this stereotype may appear to be a superficial image problem, it is nevertheless an important factor affecting the sector. Interestingly, the opposite seems to be happening in a number of economically less-advanced countries. For example, the forest industry is attracting increasing investment, employment, and interest in countries such as Brazil, Chile, China, Indonesia, Poland, and Russia.

The image of the forest industry as a smokestack sector tends to obscure the possibility that ICT could become a source of new opportunities and a new image. As has happened in so many other sectors, ICT can enable new inventions and greater prosperity. As such opportunities are not necessarily inherent in existing forest-sector structures, new and innovative ways of combining ICT

and forest-based materials or services must be sought. Another purpose of this study is to point out such opportunities.

As well as the macro-level developments mentioned above, a large number of more specific and fundamental changes are also taking place in various subsectors of the forest industry. Indeed, it is difficult to think of issues in forest sector that are not affected by ICT. On the other hand, the global forest sector is such a large entity that ICT cannot have a uniform and simultaneous impact on every part of it. For many subsectors, ICT appears to provide a new engine for progress and opportunity. For others, it can be a disruptive or even “killer” technology. In many instances too, ICT impacts cannot yet be clearly seen. Moreover, the speed at which these influences affect the sector is likely to vary among different geographical locations and subsectors. We hope the present study succeeds in reflecting this heterogeneity.

It is important to stress that ICT impacts that are slow and gradual can be as significant as immediate “disruptive” changes, principally because of the inherently long-term character of the forest sector. For example, trees planted today in natural boreal forests may not reach their optimal harvesting age for 70 to 100 years. Similarly, after a forest is clear cut, it may take hundreds of years for it to return to its original state. Forest industry investments are typically made on the basis of a 15–30 year time horizon. Thus, forest-sector issues—wood production, forest-product markets, forest conservation, and biodiversity—require a long-term view. That is why analysis of the slow, gradual trends caused by ICT is so important. Assessments and projections of these trends will draw attention to emerging problems, indicate the likely impact of interventions, and guide the development of investments and other resource-allocation decisions.

The new and changing operating environment caused by ICT also creates important challenges for forest-sector research. In basic research, new or updated models and methods may be required. In applied research, new empirical results are needed to quantify ICT impacts on the forest sector. From the applied research perspective, however, such research has important limitations with respect to future development.

There is thus a need to seek new ways of envisioning the nature of future development. Consequently, in this study, various qualitative approaches are used, along with data analysis, to try to predict the future impacts of ICT on the forest sector. Indeed, the emphasis in most of the chapters is of a qualitative rather than quantitative nature.

Here, the starting point for the qualitative approach is that the future cannot be treated as an objective fact but needs to be thought of as emerging and only partially knowable. In that sense, it should not be treated as an empirical reality but rather as a set of only partially viewable alternatives that describe future possibilities. Consequently, we present scenarios, or rather visions, of the future impacts of ICT on the forest sector. These are not intended to predict the future but rather are tools for thinking about the future. They acknowledge that the future may be unlike the past and that it is shaped by human choice and action. They also acknowledge that while the future cannot be foreseen, exploring future possibilities can inform decisions being made now. Basically, this type of approach involves rational analysis and subjective judgment. Its danger is that it may produce banal superficiality as opposed to insight. We hope that this study has succeeded in avoiding this pitfall—but this we must leave to the judgment of the reader.

History also shows that predictions and scenarios related to technological development and innovations tend to be children of their time. When the public first become aware of new innovations, their optimism is high; they think new systems or services will revolutionize society and do everything short of mixing the perfect martini. After the initial hype comes the hangover, which shows that expectations were excessive or that a too-rapid development was anticipated. This is what supposedly happened, for example, with the so-called information economy bubble at the turn of this century. It was like an “ICT tsunami” that created high and bullish markets; but when reality hit, hopes were destroyed and the resulting economic slowdown wiped out many new businesses.

Thus, the history of technological development tends to be associated with waves of great expectations followed by a rapid deflation of those expectations (Perez, 2002). And when our expectations are deflated, disappointment tends to make us believe—wrongly—that nothing of any significance will result from the new developments. In short, *technological forecasting tends to overestimate short-term impacts and underestimate long-term impacts*. It is the failure to anticipate the gradual, long-term trends, however, that can turn out to be the most fatal for many policies and businesses, in that, because of their slowness, action may not be taken until it is too late.

This study does not aim to provide instant rules and formulas for reacting to ICT changes in the forest sector; its goal is to help the reader recognize patterns and interpret the meaning of the changes caused by ICT and to promote understanding of how ICT and the forest sector intersect. As the topic of ICT impacts in the forest sector is still greatly neglected in forest research, it is imperative to draw attention to its importance, not least because—as indicated earlier—this study appears to be the first comprehensive analysis of this topic. The research task is a challenging one because the subject matter seems to develop and change much faster than research can hope to keep pace with. Moreover, the ways in which ICT will affect our societies and the forest sector in the future are likely to cause surprises. As Castells (2001, p. 195) has pointed out, “The wonderful thing about technology is that people end up doing with it something different from what was originally intended.” The present study can therefore be seen as indicative of a need for further and more-detailed analysis of the impact of ICT in many of the topic areas referred to in this book.

The study is intended not only for researchers but for a much wider forest-sector readership. It thus also addresses the strategic and policy implications of ICT changes in the forest sector. The reasons for providing this type of analysis vary in terms of the topic under discussion. Even if clear strategic and policy implications do not emerge, the analysis can be helpful in decision making. Often, the first stage of a decision process is pattern recognition; being able to systematically analyze a topic, draw attention to the major trends, and identify the important patterns may be the most we can hope to do. If only this were achieved, it would be a significant step on the road to informed decision making.

1.3 The Scope and Outline of the Study

This study is not an exhaustive one. Its purpose is to cover the issues more deeply than merely providing an introduction. Covering all possible issues would have led to a work of encyclopedic proportions—ICT has too many direct and indirect effects for them all to be covered in just one study. For example, the potential impacts of ICT on firewood and charcoal or wood energy are not discussed—even though the latter account for over 50% of total world wood utilization. The relationship between ICT and firewood is just too tenuous. Moreover, although ICT is a central enabler of, for example, biotechnology and nanotechnology development, we do not consider the impacts of the latter technologies on the forest sector. They are topics worthy of their own study.

The outline of the study is as follows. Chapter 2 places the topic in context, summarizing the main impacts of ICT in the forest sector to date. The chapter provides a historical background for the rest of the book, explaining how the relationship between ICT and the forest sector has developed thus far and how ICT is likely to affect the forest sector in the future.

Chapter 3 discusses past successes and failures in making projections and building future scenarios regarding the impacts of new innovations. It provides a cautionary reminder of our limited ability to make long-term projections. Looking back at history, we see that new innovations can have unexpected consequences and that projections can also go wrong. There is room for optimism, however, for in the past, people have been able to anticipate future developments with surprising accuracy. Clearly, some issues are easier to anticipate than others.

Chapter 4 gives an overview of e-commerce in general and its applications to the forest sector. Future scenarios and policy implications are also discussed. Chapter 5 is closely related to Chapter 4

in that it discusses the possibilities that ICT provides for forest business in terms of increasing operational productivity and efficiency.

Chapter 6 addresses one important forest products category—communication papers. The chapter discusses and foresees how ICT is likely to impact on newsprint, magazine paper, and office paper consumption and prices. It also assesses the ICT implications for the paper industry operating environment, such as the geographical location of future investments.

Chapter 7 extends the discussion of Chapter 6 to the paperboard and packaging markets. The approach taken also provides new insights into how ICT development could change the strategies of the forest industry. In that sense, the chapter has a larger relevance than the sector that it addresses.

Chapter 8 considers ICT impacts on the wood products industry. Here, as in Chapter 7, the major issues relate not to ICT impacts on the consumption of the products but on how the sector can utilize ICT to increase productivity and improve marketing. It also discusses how ICT development could be integrated into the wood products sector and into the infrastructure supporting the utilization of these products.

Chapter 9 reviews how ICT development has affected, and is likely to affect, the way in which forests are managed for the purposes of wood production and conservation.

Chapter 10 moves the focus of the study from the direct forest sector connection to a more general level. It addresses the cultural and social impacts of ICT on our societies that, in turn, will have impacts on the forest sector. One major theme raised by the chapter is the “digital divide” issue.

Chapter 11 considers the policy and governance dimension of ICT development. It asks how ICT has affected, and is likely to affect, the governance of forest policy and forest issues.

Chapter 12 provides a summary of the study and discusses the strategy and policy implications of the findings.

Appendix

Box 1.1. What Do We Mean by ICT?

The acronyms ICT (information and communication technology) or IT (information technology) have entered our everyday language in the last decade and tend to be used interchangeably, with ICT recently seeming to have become the more popular.

A number of different definitions of ICT have been established by international organizations such as the Organisation for Economic Co-operation and Development (OECD), the World Bank, and different national statistical authorities. The OECD definition of ICT is also endorsed by the United Nations Statistical Office (UNSO) and used by a number of national statistical institutes (NSIs). All the definitions tend to characterize ICT as including both hardware and software used to store, process, and transport information in digital form.

The OECD Committee for Information, Computer and Communications Policy (ICCP) established an Ad Hoc Statistical Panel to address the issue of indicators for the Information Society in 1997. The Panel recognized that the ICT sector should be defined as an industrial sector formed by bringing together business units (establishments, enterprises, or enterprise groups) that had common ICT activities. It was felt that the industrial classification ISIC Rev. 3 was the best option available for collecting indicators on an internationally comparable basis. In September 1998 the OECD definition of ICT was released.

The OECD definition

The principles underlying the choice of the activities included in the ICT sector definition:

For manufacturing industries, the products of a candidate industry:

- Must be intended to fulfill the function of information processing and communication, including transmission and display; or
- Must use electronic processing to detect, measure, and/or record physical phenomena or to control a physical process.

For services industries, the products of a candidate industry:

- Must be intended to enable the function of information processing and communication by electronic means.

The ISIC industries included in the ICT Sector:

Manufacturing:

- 3000: Office, accounting, and computing machinery
- 3130: Insulated wire cable
- 3210: Electronic valves and tubes, and other electronic components
- 3220: Television and radio transmitters, and apparatus for line telephony and line telegraphy
- 3230: Television and radio receivers, sound or video recording, or reproducing apparatus and associated goods
- 3312: Instruments and appliances for measuring, checking, testing, navigating, and other purposes, except industrial process equipment
- 3313: Industrial process equipment

Services:

- 5150: Wholesale of machinery, equipment, and supplies (part only, where possible)
- 6420: Telecommunications
- 7123: Renting of office machinery and equipment (including computers)
- 72: Computer-related activities

Source: OECD (1998), DSTI/ICCP/AH/M(98)1/REV1

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