

A Society Addicted to Paper –
The Effect of Computer Use on Paper Consumption

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Abstract

In this work I examine the concept of the “paperless society” and the notion that computers replace traditional paper-based activities with electronic ones, thus reducing the amount of paper consumed by offices. Through a review of relevant paper consumption and computer usage data, I will argue that the opposite effect has occurred; that is, computer usage has actually increased paper consumption. Then I will present some hypotheses about human behaviours that attempt to explain this surprising result.

Introduction

With the widespread introduction of computer terminals into offices, and the growing popularity of the personal computer, futurists and computer proponents envisioned the arrival of the “paperless office”. They predicted that in the near future, virtually all paper consumed in offices would be replaced by electronic, computer based mediums. Office workers, who before the advent of the computer relied entirely on typewriters, paper filing systems, and printed documents, could now create, store, and share information using computers. There would be no need to print out documents, because they would be always conveniently available for

view using any available computer terminal. Even libraries, which traditionally contain shelves upon shelves of printed books, could be replaced by a large collection of books in electronic form.

There are several main advantages of electronically stored information, as opposed to paper-based information. Content deep within an electronic library can be found using searching algorithms, and a single item within an electronic library can be shared and accessed by a nearly unlimited number of users simultaneously, who can be located in diverse geographic locations. Another advantage of a “paperless society” is environmental in nature: a dependence on paper takes its toll on our world’s forests, which are vital to the planet in many ways, such as providing oxygen, absorbing rainwater, protecting soil, and regulating climate. I would argue, however, that this environmental advantage is somewhat stretched out of proportion by computer advocates, because the manufacture of computers requires natural resources, and there are new environmental problems created by the need to dispose of computer systems frequently due to rapid changes in technology and Moore’s Law¹.

It would seem reasonable to expect that as computer technology improves and becomes more accepted and integrated into the activities of the home and office, that the need for paper would correspondingly lessen. I would expect this change to occur gradually, and that full “independence” from paper would only be achieved after many years of computerization.

There would be important economic impacts of such a fundamental change in human society, which would be felt by both the forest industry and the computer industry. The forest industry, acting in its self interest, would attempt to prevent such a change from occurring, using strategies such as creative marketing of paper products, and supporting the invention or improvement of paper-dependent technologies such as the photocopier or printer. The computer industry, and in particular the Information Technology industry, has an interest in making society more computer-dependent, and seeks to develop technology that brings more flexibility and productivity to businesses through the use of electronic information as opposed to paper-based information.

Such a major shift would also have an effect on our collective ability to produce, share, and disseminate knowledge, as well as possibly changing the way our society preserves and enriches its culture.

However, for reasons which I will speculate on later in this paper, statistics show that with the introduction and acceptance of computers into society, paper consumption has not decreased. In fact, per-capita paper consumption has actually increased. After presenting a

statistical analysis, I will theorize that this increase in paper consumption is partially caused by the increased computer usage, as well as present reasons why people are still “addicted” to paper.

Background

In July 1945, Vannevar Bush (1890-1974) wrote about Memex, which was his term for a machine to store and retrieve a library of information at a desk, and also to link related bits of information together in a fashion similar to hyper-linking.² Envisioning the databases and information systems of today, he saw Memex as a way for scientists to share and disseminate knowledge, helping them to wade through the enormous volume of information being produced and find the important gems. Storing vast libraries in a Memex system would replace printed books, and would aid in search and retrieval of information. Much of what Bush predicted has come true; database and storage technology has indeed advanced significantly, and the World Wide Web (WWW) along with search engines such as Google is the closest thing to Bush’s Memex machine.

Indeed, many activities which were done with paper now depend on computers. For example, the process of writing, before the introduction of the word processor, involved the manual acts of handwriting or typing on paper, but now the writing of an article or letter can be done without ever printing a single page. Even the printing industry has become computerized such that the work of writers can be approved and edited electronically, and that no paper needs to be used until the final printing stages. Databases have replaced many paper

filing systems, and e-mail and fax technologies have reduced the need for sending letters through “snail mail”, or postal services.

Next, considering these new ways that electronic information has integrated itself into commonplace activities in the home and office, it would be useful to examine any changes in paper consumption rates that have occurred over the relevant time period. The statistics which I present in the next section address this issue.

Method

Data on Canadian consumption of paper was collected by the Pulp and Paper Products Council and published on the internet by American Process Inc. Statistics on Canadian population were obtained from the Statistics Canada CANSIM database. A calculation was used to combine these data sets, to obtain a statistic of Canadian paper use per capita. This data is listed in Table 1. Table 2 contains data on Canadian Computer Use, also obtained from the Statistics Canada CANSIM database. Through regression analysis, I attempted to find a relationship between the data in the two tables.

Results

Statistical analysis shows that there is no apparent decrease in per-capita paper consumption due to increased computer usage. In fact, from 1997 to 2000, paper consumption actually accelerated. A linear regression model was applied within a confidence of 95.0, and in the resulting equation, the coefficient in front of the dependant variable (i.e. the proportion of computer use) is positive.³ Thus we can see that paper consumption

is still increasing with computer use. This relationship is shown in Figure 1.

Table 1:
Apparent* Canadian Consumption of Paper⁴
Canadian Population⁵
Paper Consumption Per Capita (Calculated)

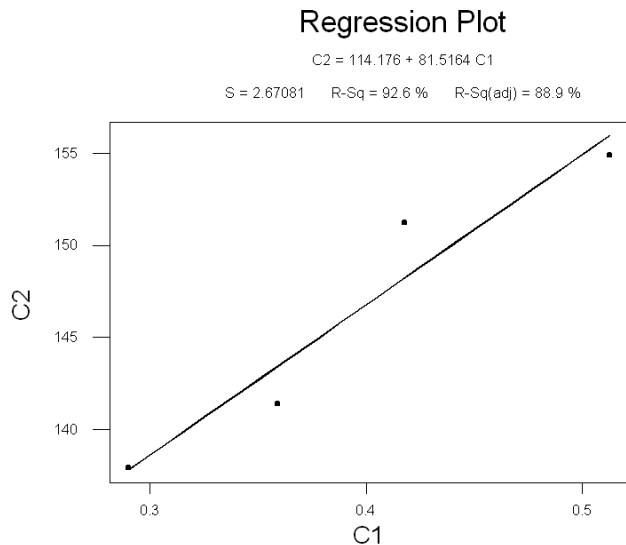
Year	Total Paper Consumed (000's Tonnes)	Canadian Population	Paper Consumption (000's Tonnes) Per Capita x 10 ⁶
1980	2609	24516278	106.419
1985	2928	25842590	113.301
1990	3455	27700856	124.725
1991	3342	28030864	119.226
1992	3452	28376550	121.650
1993	3643	28703142	126.920
1994	3882	29035981	133.696
1995	3970	29353854	135.246
1996	3833	29671892	129.179
1997	4136	29987214	137.925
1998	4278	30248210	141.430
1999	4613	30499219	151.250
2000	4766	30769669	154.893

*Apparent consumption is equal to domestic shipments plus imports.

Table 2:
Canadian Computer Use⁶
Percentage of Households who use
Computer at
School, Home, Work, or Other Locations.

Year	Percentage
1997	29
1998	35.9
1999	41.8
2000	51.3

Figure 1:
 Linear Regression Plot
 C1: Percentage of Computer Use
 C2: Paper Consumption
 $C2 = 114.176 + 81.5164 C1$



Discussion

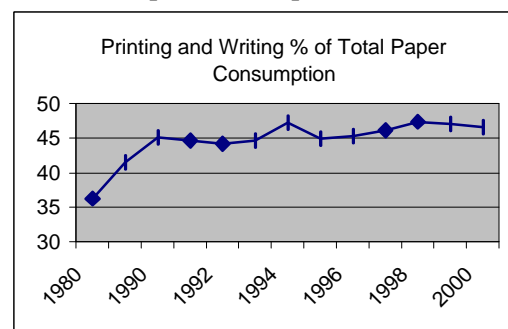
From these consumption statistics, it is evident that paper's role in home and office activities is still very significant, if not increasing in significance. How can this be, when many paper based activities are now done using computers? In fact, not only is office paper use increasing, but office paper use is actually growing faster than other types of paper use. Further statistics presented below show that the percentage of printing and writing paper out of total paper consumption has increased by over 10 percentage points from 1980-2000. These statistics are shown in Table 3 and Figure 2.

Table 3:
 Canadian Printing and Writing Paper Consumption Compared to Total Canadian Paper Consumption⁷

Year	Printing and Writing (000's Tonnes)	Total Paper	Printing and Writing % of Total
1980	946	2609	36.2591031
1985	1215	2928	41.49590164
1990	1560	3455	45.15195369

1991	1494	3342	44.7037702
1992	1525	3452	44.17728853
1993	1628	3643	44.68844359
1994	1832	3882	47.19216899
1995	1783	3970	44.91183879
1996	1737	3833	45.31698409
1997	1908	4136	46.13152805
1998	2028	4278	47.40532959
1999	2172	4613	47.0843269
2000	2221	4766	46.60092321

Figure 2:
 Printing and Writing Percentage of Total Canadian Paper Consumption, 1980-2000.



The Advantages Of Paper

Besides being relatively inexpensive, and easily accessible, paper still has several advantages over electronic based mediums. The first is *tangibility* – for important documents such as contracts, paper can be signed and have legal binding. Paper documents can be annotated and edited by hand, and passed on to other readers who can add their comments. Although new features in word processing software allows for a similar kind of collaboration and review of changes, the paper based process is still more intuitive for many people. While electronic documents can only be viewed on the limited screen space of most monitors, actual printed papers can be easily spread across a desk, allowing a person to quickly switch between documents and pull out important sections without navigating confusing task bars or menu bars. The second advantage is *versatility*: paper has very

high resolution, can display thousands of typefaces, does not “crash”, cannot be accidentally erased, and can contain built-in hyperlinks such as tables of contents, page references, and indexes.

Home and Office Printing

Desktop printing is one of the reasons why paper use has increased alongside computer use. In 1984, Hewlett Packard first marketed the “LaserJet” printer.⁸ This was an important milestone for desktop printing, and marked the beginning of a new, paper hungry workplace. Not surprisingly, from 1980 to 1990, the percentage of printing and writing paper out of all paper usage grew nearly 10 percentage points (which the statistics presented earlier show). With laser printers and photocopiers becoming ubiquitous in the office, never before was paper so easy to consume.

Conclusions

While it is true that computerized documents have some advantages over paper, the converse is also true. The concepts of the “paperless office” and the “paperless society” are fanciful envisionments of technology promoters – they are ideals which are interesting to consider, but are unlikely to ever be realized. Statistics show that both paper consumption and computer usage are increasing in Canada, and that there is no obvious trend to a reduction in paper consumption due to computer use. But this discussion is somewhat limited in scope: documented examples from Japan show that some companies have decreased their paper consumption by 30-50 percent as a result of new information technology.⁹ And on the other end of the spectrum, electricity has not yet reached some two billion people, a third of the world's population.¹⁰

Because of the usefulness and advantages of paper, and the ease of consumption provided by printers and photocopiers, it is likely that paper consumption will remain at high levels for many years to come. Of course, technological innovation does not stop either, when even now, inventors are working on “paper-like” substances whose content can be electronically altered in a matter of seconds. Perhaps the most interesting chapter in the story of paper has yet to be written.

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- ⁴ *Canadian Pulp And Paper Industry Key Statistics As Published by the Pulp and Paper Products Council*. American Process Inc. <<http://www.americanprocess.com/canadapulp/summary.html>>
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- ⁶ Statistics Canada CANSIM Data Base. Series: D10505, Source: SDDS 4432 STC (63-016XPB)
- ⁷ Same as (4).
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