

Project Exposé

Information management functions in national economies.
An analysis of the information sector in Austria

Christian Schlögl¹ and Robert M. Hayes²

¹University of Graz
Institute of Information Science
Universitätsstrasse 15/F3, A-8010 Graz
christian.schloegl@uni-graz.at

²University of California at Los Angeles
Department of Information Studies
GSE&IS Building, Box 951520, Los Angeles, CA 90095
rhayes@ucla.edu

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Abstract

The information sector has been an area of research for more than 40 years and researchers still try to find different approaches to this topic. This project approaches the investigation of the information sector from an information science perspective. Information management functions – i.e. all functions and processes related to information selection, information acquisition, information description, information preservation, information product creation and information services - will serve as a starting point when analyzing the information sector. The fundamental assumption is that these functions do not occur only in libraries and information centers but also in other contexts. Accordingly the central hypothesis is that the economic costs associated with information functions, represented by labor and capital necessary for their performance within national information economies, can be measured in a wide range of contexts, including libraries but also including industries of various kinds.

The methods used in this research project consist of a set of models and various sets of data to which the models will be applied. The three specific models to be used will be the Library Planning Model, the National Input-Output Matrix and the Industry-Function Model. The two primary sources of data are library related data (statistical data on libraries) and national economy related data (Input-Output-Matrices).

One of the main goals of the project is to investigate the extent of information management functions in national economy. Therefore, the results of this project can assist to make decisions about information policy issues and make industry aware of the needs they have for professional expertise in information management. Furthermore, a framework could be provided for investment and manpower requirements to support entrepreneurial development. Since the project uses a methodology developed by Robert M. Hayes, who has already conducted similar research in the U.S., it will be further possible to position the project outcome in an international context.

Keywords: information management functions, information sector, information economy, Library Planning Model, Input-Output Matrix, Industry-Function Model

1 Introduction

Nowadays only few people would disagree with the assertion that we live in an information dominated era, where “... *the information factor increasingly holds the key to growth, output and employment...*” (Martin 1988, 69). Factors of production like land, labor and capital, the basic economic resources in the industrial society, lost economic importance and are increasingly replaced by the factor information. The rising significance of the information sector is undisputed. Drucker noticed the emergence of the new industry already in 1960, when he introduced the terms “knowledge work” and “knowledge worker” (Drucker 1993, 5). Only two years later Machlup conducted the first important study on the “knowledge industry” which concluded that already in 1959 approximately 43% of the “potential civilian labor force” could be assigned to the “knowledge producing industry” (Machlup 1962, 386). Another ground-breaking study was performed by Marc Uri Porat in 1977, who introduced the term “information economy”. This study has not yet lost its significance, because much research is still based on or related to it. This applies, for instance, to Rubin and Taylor who updated Porat’s data concerning the information economy in 1981, or to Apte and Nath (2004), whose aim was to measure the size and the structure of the US information economy and to compare the results with Porat’s study.

As this short literature review shows, the concept of the information economy has been known for more than 40 years but has not attracted an enormous interest in economic circles (Martin 1988). The total number of research studies on the information sector is still small although the information segment has been steadily increasing. This increase of importance has been taken into account by the U.S. Census Bureau, which introduced the new category “information sector” in its 1997 Economic Census.

The project described here follows an approach developed by Robert M. Hayes, who has been working on this topic for many years and who has conducted a similar project in the United States. The collaboration with Robert M. Hayes offers the opportunity to adopt the already available framework and to investigate the Austrian situation, because no research – as far as the authors know – has been conducted in Austria up to now. The methodology differs from other approaches in that it advances the investigation of the information sector from an information science perspective. Accordingly information management functions form the starting point when analyzing the information sector.

2 Definitions

The two key terms as they are used in the project are

- national information economies
- information management functions.

2.1 National information economies

In the past national economies have been divided into “sectors”, which historically included:

- (1) agriculture sector
- (2) manufacturing industries sector

(3) services sector.

Because of statistical data and the general perception of the increasing importance of information, there is more and more evidence to suggest the introduction of an

(4) information sector.

According to Hayes (2001) this sector can be subdivided into three segments:

- information technology industries segment
- information transaction industries segment
- knowledge industries segment.

The term national information economy is used in this project to represent these three segments of the information sector (Hayes 1992). This distinction will allow a more precise analysis of the information sector.

(In this context it should be noted that the information sector draws some component industries from the traditional manufacturing industries sector and those industries are therefore removed from the manufacturing industries sector. In the same vein, the information sector draws some of its industries from the traditional services sector, and those industries are therefore removed from the services sector.)

Information technology industries

This segment includes industries that produce hardware and software for telecommunications, computers, and a variety of other technologies that acquire, communicate, and process data (such as medical and scientific instrumentation).

Information transaction industries

This segment includes those industries in which the primary emphasis is on the processing of transactions which represent actions taken but have substantive value only in that processing. This includes telecommunication services, banking and related financial activities, retail and wholesale transactions, reservation services (such as for hotels, air travel, autos, tourism), and a wide variety of similar transaction processing contexts.

Knowledge industries

This segment includes those industries in which the substantive content of the information is significant. It includes education, research and development, the professions (law, medicine, engineering, architecture, etc.), and what traditionally are called "Miscellaneous Business Services" (e.g., consulting, related services). Also libraries are an integral part of this segment.

2.2 Information management functions

Information management functions are essentially the functions and processes which are connected with

- information selection
- information acquisition
- information description (metadata creation)

- information preservation
- information product creation
- information services.

Traditionally, these functions are well defined in libraries and information centers.

Information selection

These are the processes involved in selecting material to be acquired. They involve assessment of relevance, quality, reliability, the nature of the source, and the costs. They require a balancing of costs (for acquisition and for related processing) versus needs, on the one hand, and of costs of acquisition versus potential losses from not acquiring, on the other.

Information acquisition

These are the processes involved in actually acquiring material, including ordering and paying for it, in handling the materials, and in preparing them for storage and use.

Information description

Historically, of course, the formalized description of information was known as cataloging, although the term “metadata creation” is frequently being used to represent the same process. Certainly, whatever its name, it is a crucial technical service, providing the means both for managing the collection of materials and for using it. In libraries, it provides the database for the OPAC (online public access catalog) and for both internal operations and services to users.

Information preservation

Preservation is one of the two imperatives especially for major research and national libraries (the other imperative being access). It has two aspects: preservation of the artifact and preservation of the content. Each is important, but for different reasons. And in each aspect, economic issues are significant, again for different reasons.

Even in the age of the electronic distribution and digital libraries, preservation is important, and there are major national and international efforts to assure that the records of the internet, just as an example, will be appropriately preserved.

Information product creation

An “information product” is a pre-established package intended to meet the needs of a group of customers without essential change or intervention by staff. In libraries, examples of information products are the OPAC for a library and similar online databases produced and/or maintained by the library. Another example would be pre-packaged reference protocols. For libraries with unique special collections, digital libraries based on them are increasingly important. Packaged library instructional programs, either online or in person, are provided by most academic libraries. Some libraries take responsibility for production of scholarly publications.

Information services

In contrast to information products, information services respond to the need of individual customers. Circulation of materials in libraries is certainly a service of primary importance as is individual reference services, whether online or face-to-face. Frequently, instructional services are one-to-one rather than pre-

packaged. Many libraries provide consulting services; indeed, this is especially important in industrial libraries and information centers.

3 Assumptions and hypotheses

The central hypothesis is that economic costs associated with information management functions, represented by labor and capital necessary for performance of them within national information economies, can be measured in a wide range of contexts. These contexts can be libraries and information centers where these functions are well defined and can be measured because there are well established and reliable data sources. However these information management functions occur also in industries of various kinds. Especially in the knowledge industries they play an important role. Hence a more specific hypothesis is that the costs for information management functions within libraries can serve well as a basis for measuring those costs in contexts other than libraries.

4 Objectives

4.1 National economic policy

The most important objective of the project is to investigate the extent of information management functions in Austrian national economy. The following list of objectives can be derived from expected results.

The transition of national economies from being based on manufacturing to being based on information is a reality throughout the world. The **first** objective therefore is to provide results that can assist in making decisions about information policy issues. Among national policy concerns should be educating the workforce that must make a transition from manufacturing and non-information services into the information economy.

As the wealth of information of value to business in general has increased, their means for access to it have not similarly increased. Of course, the technology is there but the information management functions in searching and evaluating require special expertise and that is in short supply. Hence, a **second** objective is to provide results that will identify the needs for such educational support and assist in determining what workloads will be.

A **third** objective is to make industry aware of the needs they have for such professional expertise and of the means by which they can gain access to it.

Especially libraries can serve as gateways for internet access, with their highly skilled professional staff providing the necessary support. So a **fourth** objective is to assist the directors of libraries, especially of academic libraries, in identifying a new role for them.

Perhaps most important, there are real opportunities for entrepreneurs to establish businesses that will serve the needs of industry. Those entrepreneurs need to have a valid, comprehensive picture of the market, the demand, the customers for those products and services. A **fifth** objective therefore is to provide a framework in which assessments can be made of risks and returns, of needed investment and manpower requirements to support entrepreneurial development.

4.2 Social policy and management

In the listing of objectives in the context of national economic policy, it is evident that there are social policy implications as well. A better educated workforce that can work effectively in an information rich environment means a better social environment.

Many of the above mentioned objectives represent also management concerns, both library and corporate management.

4.3 Broader impacts

Since Robert M. Hayes has already conducted similar research in the U.S., it will be further possible to position the project outcome in an international context. The international character of the project should also enhance the working relations among the all institutions involved. Later on it is planned to compare the results with the outcomes of a similar project which is conducted in Croatia.

5 Methodology

The method for the research is based first upon allocation of industries to identified sectors of the economy and to segments within them, second, on the use of an input-output matrix to represent the structure of the economy and the use of information segments within it by the various sectors of the economy, third, upon measurement of the labor and capital involved in information centers in each component of that structure, and, fourth, on the resulting relationship between information centers and the use of information by the various sectors.

The methodology involved in this investigation consists of a set of models and various sets of data to which the models will be applied. There are three specific models that will be used:

- Library Planning Model
- National Input-Output Matrix (Leontief Matrix)
- National Industry-Function Matrix.

5.1 Library Planning Model

The Library Planning Model (LPM) (Hayes 2001) is a means for estimating staffing requirements to meet identified workloads on information management functions in technical services and reader services. It will be extended to applications beyond just libraries as a means for estimating the staffing requirements for parallel or cognate services in non-library contexts.

Some contexts, such as archives, are essentially similar to libraries, but others and especially industrial contexts are dramatically different. It is those contexts that are of special interest to the project. But the library and library-like contexts provide a useful starting point since the data are well defined and reasonably reliable.

5.2 National Input-Output Matrix

The National Input-Output Matrix (known as the Leontief matrix) is a useful tool that represents the purchases by each industry from each industry within a national economy (Leontief 1986). The most important use of an input-output matrix is to determine the distribution of production in order to achieve a desired level of final consumption. But it can serve other purposes as well, among them identifying the relationship between production in a given industry or group of industries and a given industry's use of the resources from other industries. It is the latter purpose with which this research project is concerned.

	Agri- -culture	Manu- -facturing	Serv- -ices	Infor- -mation	Industry Sales	User Sales	Total Sales
Agriculture	\$295	\$33	\$75	\$19	\$422	\$371	\$792
Industry	\$112	\$1,820	\$196	\$405	\$2,533	\$2,458	\$4,990
Services	\$54	\$320	\$107	\$161	\$642	\$2,476	\$3,118
Information	\$62	\$433	\$417	\$1,399	\$2,311	\$2,575	\$4,886
Purchases	\$523	\$2,604	\$795	\$1,984			
Value Added	\$271	\$2,289	\$2,264	\$2,988			
Totals	\$794	\$4,894	\$3,059	\$4,972	\$5,907	\$7,880	\$13,786

Table 1. Input-output analysis at sector level (data for U.S. economy in 1996, in billions) (source: Hayes)

The input-output matrix for the U.S., for instance, consisted of 107 national accounts (= 107 rows and columns) in 1996. For purposes of analysis, industries can be aggregated at different levels. When assigning these industries to the four main sectors, one gets the values shown in Table 1. As can be seen, the services sector, for instance, receives most of its input (\$ 417) from the information sector. Please note that this limited display is simply to illustrate the process of analysis. The array of such analyses, that will be done in the project, will be far more detailed and extensive. At a further level of detail, these sectors can be subdivided into segments. A potential analysis (conducted by Hayes for Australian data) could then determine the percentage of value added spent by each of these segments for purchases of information products and services (see Table 2).

		Information/value added		
		I1	I2	I3
A	Agriculture	0.01%	0.44%	4.02%
B0	Mining	0.20%	0.19%	1.50%
B1	Low Technology Mfg	0.65%	1.10%	8.73%
B2	Services	0.68%	3.23%	9.13%
C	High Technology Mfg	1.35%	4.04%	17.62%
I1	Information Technology Industries	9.14%	5.32%	19.58%
I2	Information Transaction Industries	0.18%	11.60%	24.24%
I3	Knowledge Industries	0.38%	7.02%	25.98%
Totals	For all Industries and Services	0.85%	3.99%	13.81%

Table 2. Percentage of value added spent for information (Australian data) (source: Hayes)

5.3 National Industry-Function Matrix

The National Industry-Function Matrix, unlike the National Input-Output Matrix, is more speculative. It attempts to estimate the distribution of the national workforce by type of function within each industry. It is based upon a limited set of parameters that are applied to the reported data for distribution of the workforce among industries (Hayes 2001).

6 Sources of data

There are two primary foci for sources of data:

- library related data
- national economy related data.

6.1 Library related data

Statistics Austria (<http://www.statistik.at>), responsible for performing scientific services in the area of federal statistics, and the Magistratsabteilung 5 (Statistics and Analyses) of the city of Vienna did an extensive gathering of statistical data on libraries (academic, special and public libraries) in Austria. These data have been published within the framework of the Austrian “Kulturstatistik 2004” and are online available. Nevertheless it is assumed that additional data collection will be necessary in a few cases. Furthermore data about students, researchers and university staff will need to be gathered.

On the basis of these data, all analyses will be performed by means of the Library Planning Model.

6.2 National Economy Related Data

In Austria, Statistics Austria is the crucial agency for economic data in general and for the National Input-Output Matrices in particular. The Input-Output Matrix is the primary source of data for the national economy. Since the last statistical report for libraries derives from 2004, the year under review for the Input-Output Matrix will also be 2004.

7 References

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