

Toward a Research Agenda for the Study of Business Practices in Information Industries

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Abstract

This research considers business practices in the Information Age. We present an economic-theory based view that defines products as bundles of goods, services, and information. Products that consist solely of information, that which is recorded about something, are information products. Organizations or business units that produce and/or sell only information are information-only businesses. Information Industries consist of organizations that produce and/or sell primarily information products. Research into the business practices of the organizations that make up Information Industries is scant at best. Current business thinking is still rooted in the Industrial Age, which was concerned with producing and delivering physical goods. This paper summarizes the results of a literature survey identifying Information Industries' business practices. These results, in conjunction with interview-based research in progress, form the basis for further research into information-only businesses' actual business practices.

1. Introduction

Increasingly pervasive phenomena such as the Internet and e-commerce herald the dawn of the Information Age. In the Industrial Age, products were typically physical, tangible goods and assets such as cars and factories. However, manufacturing is now typically less than 40% of most developed countries' GDP [15], whereas the services sector in recent years has been well over 50% of GDP in the U.S. [47]. Information and information technology represent a small share of the total economy, but has growth rates of 10-15% annually [48]. Use of the World Wide Web and the Internet is growing exponentially. Among the most influential firms are those that deal with the creation, exchange or management of information (Microsoft, AOL, Yahoo).

The underlying paradigms of the Industrial Age and the Information Age were contrasted in [21] [42] and [46]. Our understanding of the business practices of the Industrial Age is the result of over a century of observation and research. For the most part, these practices are rather well defined. The Industrial Age tends to be characterized by large firms, producing highly standardized physical goods, in capital-intensive plants such as car plants or steel mills. Changes in products and industry structure tend to be of lesser magnitude and occur gradually (over several years or even decades). Research in innovation [7] has shown that, even in fast-changing industries, established firms might miss major "disruptive" developments if they stay focused on current customers and market segments. Recent, information-based, trends towards so-called "mass customization" [34] in certain industries such as automobiles and electronic components represents a minor difference in form rather than a major, substantive departure from mainstream Industrial Age thinking. Like physical products, information products can be mass customized, as seen in the My<xyz> web sites, for example, MyYahoo or MySchwab. In the emerging Information Age, size may not be a determining characteristic, as larger firms compete with smaller, fast-moving firms, producing and selling information from knowledge-intensive offices.

The study of appropriate business practices for Information Age firms has not yet occurred to any significant extent. Current business models are still rooted in an Industrial Age context of physical goods, production processes and delivery mechanisms. For example, the well-known "Core Competence" concept [37] is based on examples of physical goods companies such as Honda. The consideration of chaos theory and complex adaptive systems [4], arguably important concepts for the Information Age, are still illustrated with cases of physical goods companies such as Hewlett-Packard. Often heralded examples of e-commerce are companies that sell tangible, physical goods such as Dell Computers or Amazon.com.

The emerging Information Age paradigm needs to be translated into new business thinking and management theories. As the Information Age evolves, business *strategies* will need to acknowledge a changing environment, particularly with respect to the velocity of competitive dynamics. In strategy research, few mainstream theories even acknowledge the transition to the Information Age, despite increasing pressure on organizations to respond to faster rates of change. Dominant strategy theories such as Industry Structure Analysis, or the Five Forces Model [36] are static models. More recent theories, such as the resource-based theory of the firm [3], or the knowledge-based theory of the firm [26] or [16] acknowledge change and copying of resources or capabilities, but do not concern themselves with the rate of change. Such theories view information (or knowledge) as a resource or factor in the development of goods and/or services, but not as a product in its own right. A recent conference and subsequent book on Fundamental Issues in Strategy [41] did not examine Information Industries in any detail. The dominant strategy research is still rooted largely in the Industrial Age, with some exceptions, as noted in [20], and has not focused on Information Industries. This vacuum is evident at the theoretical as well as practical level.

It is by no means obvious that the relationships between business strategies and organizational success will retain their present forms in the coming Information Age. It is also logical to assume that effective implementation of appropriate Information Age *tactics* will be increasingly dependent on Information Systems. It is therefore necessary to study not only the strategic shifts, but the tactical ones as well. For example, the selection of an appropriate information infrastructure and the techniques that are used to satisfy information requirements can only become more important as information-based products become the norm.

So much has been written about the transformation of information systems from reactive record keeping necessities to proactive competitive weapons that there is a temptation to assume the necessary success stories have been sufficiently documented. The classic business process re-engineering case studies using information technology, such as Ford, Otis Elevator, and Federal Express are all but a mantra to many business disciplines. The fact that businesses of all types deploy information systems to support their core processes is tautology. However, this so-called 'classic' research has been in a context of organizations that produce physical goods or provide traditional service products.

It is important to recognize the differences between the role that information plays in industrial organizations and information organizations. In the former, information is used to support primary business activities. In the latter, producing and selling information IS the primary business

activity. What should an organization do *when information is the product?*

1.1 Research Focus

The focus of our research is what we refer to as *Information Industries*. Information Industries are a collection of organizations or business units that produce and sell mainly information, without production or delivery of substantial physical goods or services. Examples may be found in banking and financial services, the movie industry, the publishing industry, the software industry, or information providers on the Internet, such as Yahoo. The near-collapse of Encyclopedia Britannica showed, however, that encyclopedias were more subject to the economics of the physical medium (paper) than the economics of information [11]. Printed books, movies on videocassette, music on Compact Discs, exhibit similar (albeit less dramatic) characteristics. In this research, we are specifically interested in the pure case of an *information-only businesses*, which is an organization or business unit that produces or sells *only* information. How are their business practices different from producers of goods or providers of services? It may not make sense to apply Industrial Age business practices to such businesses. Appropriate (new) business practices have yet to be identified and are not yet clear. Are the appropriate strategic and tactical options different? Should they be? Indeed, what are they in the first place? Few if any references to research into the workings of information businesses and the Information Industry are to be found in contemporary literature.

2. Theoretical framework

2.1 Economics of Information

Success in the Industrial Age was based on the economics of mass production, which are well known and therefore only briefly summarized. The idea behind mass production, or its latter-day refinement into mass customization, is that relatively high fixed costs of the production infrastructure are spread out over a large number of essentially standardized units of a good. In addition, each unit of a physical good has a non-trivial marginal cost for raw materials required to produce it, as well as costs for transportation from the producer to the buyer. Given a sufficient volume of production, the resulting price of a physical good is based, to a large extent, on the marginal cost.

While a similar argument can be made for services, price is usually based on the relative scarcity of the service provider. The economics of services are further constrained by the fact that the customer, or his agent, is

often involved in the value-adding service activity. This makes it very hard to achieve significant economies of scale. Service locations (e.g. for a haircut) cannot be centralized like car manufacturing. There are also severe limits to how much an activity such as consulting can be automated when the customer sees the person providing the service as an integral part of the value added.

Information-augmented production of physical goods (e.g. CAD/CAM, robotic assembly plants, etc.) and information-based delivery channels (e.g. on-line ordering and interactive markets such as electronic grocery shopping) offer hints of the types of changes in thinking needed to effectively produce and distribute information products. While valuable lessons may be learned from the study of leading edge manufacturing and e-commerce, we suggest that they fall short of the mark due to differences in the fundamental nature of information products. The underlying economics of information products are vastly different from those of physical products or traditional service offerings. Economists are quick to point out, and we readily agree with the assertion, that information products do not violate the laws of economics, nor do they require the formulation of new laws. The real issue is that business practices in the Industrial Age never needed to consider the economic characteristics of information.

Information is subject to complex problems of appropriability [16], meaning that it is difficult for the seller to generate a return that captures the value created by the information. There are at least two reasons for this. First, information is a “non-rival” commodity. After a sale, both the seller and the buyer can still use it and still have it, although not own it in a strict sense. That is why software is licensed to customers rather than sold. Second, revealing any part of the information during marketing or selling obviates the need for buyers to pay for that part of the information.

In the Information Age, the concept of increasing returns is prevalent [1]. This is the tendency for that which is ahead to get further ahead. Expressed colloquially, the rich get richer. When information is exchanged, new information may well be generated in the process. As a result, it may make sense to share information, which you can still keep anyway because it’s a non-rival commodity, in order to acquire more. This is most certainly not true of physical goods or services. A related concept is that of network externalities, as seen in airlines, telephone/FAX networks, and an installed base of software [24]. The larger the network, the more valuable it becomes. Being able to contact only one other person via phone (or FAX) is much less attractive than being able to contact anyone in the world. Similarly for information products, the larger the installed base, or the more people with whom you can exchange information, the higher the value of that “network.”

Two characteristics of information have an important influence on changing industry boundaries and industry structures [43]. The first is *information separability*, or the extent to which information can be meaningfully separated from the transaction generating the information and captured in digital form. The second is *information specificity*, which is the extent to which the value of information is restricted to its use or acquisition by specific individuals or during specific time periods. This view is based on information as a resource in providing goods and/or services. However, when information is separable, it may be produced and sold as a product. Related to the information specificity, is the concept of information “stickiness” [49]. Stickiness is the incremental expenditure required to transfer that unit of information to a specified locus in a form useable by a given information seeker. Under certain conditions, stickiness leads to users doing the application-specific portion of product development (for, e.g., Computer Telephone Integration software), with the product vendor potentially appropriating less benefit.

All of the costs associated with producing information are incurred and sunk by the first unit. Each copy of an information product, such as a 25-page academic journal article distributed electronically, has a *marginal* cost that is *virtually zero*, perhaps except for a copyright payment [6]. Hence, information-only businesses can no longer compete on the basis of cost reduction. The cost factors have essentially been driven out of the equation. Moreover, the selling price is not based on cost, but on how much customers are willing to pay: “The price [of information] fluctuates widely on the basis of subjective feelings and judgments, themselves dependent on the circumstances in which the buyer and seller find themselves” [42]. Internet-based delivery of information (e.g. academic journals, telephone directories, Mars Observer images, special prosecutor’s reports) present but one example of this phenomenon.

Since different customers have varying degrees of willingness to pay for information products, a (multiple) *versioning* strategy makes sense, including releasing future versions of a product that are less capable than their predecessors [44]. While this approach will make sense for a firm looking to ‘skim’ various market segments, it has significant implications for product developers. Consider software, where the notion of incremental prototyping as a development tactic seems rather inappropriate in a context where the full- featured product will be the first release rather than the last.

Information can also be distributed differently. Larger firms (e.g. Microsoft, Symantec) have already largely abandoned physical distribution of updates to their products. Corrective service releases and patches (a.k.a. bug fixes) are now routinely available via the Internet rather than physical media. This has affected the

frequency of updates as well, since the entire ‘cycle time’ to make an update available now can consist of the time required to post it to an FTP site. Although it could be argued that vendors have merely shifted many of the costs and burdens of the update process to end users, the authors believe that much more is at stake. The incidental and falling costs of Internet use render the cost shifting argument largely irrelevant. Referring to our earlier observation, users are indeed willing to ‘pay’ for Internet -based updates because of their overwhelming convenience, but the marginal costs are trivial. Still, the Web sites have a non-trivial cost to set up and maintain.

On the other hand, some have set the price equal to marginal cost, i.e., zero. Consider the example of a newspaper (e.g., Chicago Tribune) providing its current content on-line and free of charge. The difference in price (i.e. 50 cents for the hard copy v. free on-line) is largely accounted for by marginal costs (e.g. printing presses, paper, energy, etc.) of actually printing and distributing the newspaper.

One assumes that the inconvenience of reading a newspaper through a Web browser will motivate many readers to purchase a physical copy. Also, many vendors have raised revenues by selling banner ads, or ‘billboard space’, on their Web sites for third party advertisers. Of course, in the publishing industry, selling advertising has long been an important source of revenue.

The shift in production and distribution cost structures eliminates the advantage enjoyed by larger firms in an Industrial Age context. Indeed, size may prove to be a liability rather than an advantage when the ability to respond quickly to market changes is of paramount importance. A startup Internet-based business can essentially enter the market on a global level from day one. The URL for “newfirm.com” is just as easily accessed as the Microsoft home page. While we readily admit that access to a market does not equate to large market share, we note that in a world of physical markets, it was essentially impossible for a startup to have a product available from day one to a global audience. Size may also prove to be an advantage rather than a liability, because the firm has so many more points of contact with the marketplace. New organizational forms and competencies such as knowledge management may be needed to exploit such advantages of scale.

Contemporary management theories and practices have, with varying degrees of success, adapted to the use of information as a factor of production. However, we are interested in businesses where *information is the product*. Given the radically different economics of information-only businesses, we expect to find that new and different business practices and new management theories will emerge to reflect the change. However, should it prove that there are no essential differences, the finding would be equally, if not more, interesting.

2.2 Product = good + service + information

It is important to recognize the economics of information products, and to distinguish information products from physical goods, services, or hybrids. To that end, we view a *product* as a bundle of physical goods, information or services, as shown in Figure 1. We define a *physical good* as a tangible object, with properties such as size and weight. Examples of physical goods would be cars or computing hardware. Services are different because they are not a thing in any sense, but an activity. We define *service* as an activity that the customer values, in which the customer, or the service provider as his agent, participates, and that is performed by a physical machine (ATM cash withdrawals), a person (consulting sessions), or a combination (car repairs). Last, but not least, we define *information* as that which is recorded about something; for example, a musical performance or accounting data. It is important to note that information is conceptually independent of the medium on which it was recorded (e.g., a vinyl record or brain cells).

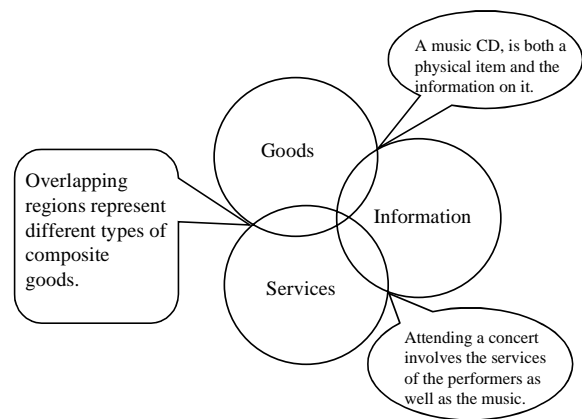


Figure 1 – Products as Bundles of Goods, Services & Information

The goods, services, and information that comprise a product each have specific and different characteristics that determine the economic characteristics of any bundle. Consider an automobile, which is a tangible object with physical properties such as length, width, height, color, etc. Yet the purchase of a (new) car also typically includes a warranty (a service component), and information about the car, typically in a printed booklet. Certainly the service component is a vital part of the total product package, but the physical car dominates the economic characteristics of the bundle.

A university course consists of the instructor’s performing specific tasks such as lectures (a service component), students interacting with other students (a

service component) as well as the knowledge transferred by the instructor (information). Although a university course may seem like a transfer of information, most of the information that is transferred can be bought at a small fraction of the cost in the form of a book or articles. The dominant economic characteristic is that of the services components.

Consider a book, which is essentially the story (information) contained in it, but it also consists of paper (a physical good). Economics of books as a product are influenced by the information component (paperback versions available after some time), but also the physical component (non-trivial marginal costs for the paper, printing and distribution) as the example of the battle between Encyclopedia Britannica and Encarta showed so dramatically [11]. Also, a collection of songs recorded on a vinyl record or a CD-ROM consists of the recording (information component) and the medium upon which they are recorded (a physical good). In the case of the vinyl records or CDs, the economics of those bundles are in part influenced by the marginal cost of producing and distributing them (at least \$2-\$3 per copy). More so for vinyl records than for CDs, because vinyl records were more difficult to make and heavier to transport. Consider the same songs available in MP3 format for downloading or use over the Internet. Their economics are exclusively information-based, since there no physical goods or services are part of such products.

2.3 Information-only businesses and Information Industries

We define *information-only businesses* as organizations or business units that produce and/or sell only information. Although we would ultimately like to separate the medium from the message, so to speak, and they may not perfectly capture the pure case as we define it, a myriad of examples may be found in alternative versions of physical or service products with Web-based delivery systems. These could include on-line telephone directory services, MP3 music delivery, re-packaging of broadcast services such as MSNBC.COM, INTV.NET, and other media services, interactive medical consulting services such as WEBMD and the apparent ubiquity of on-line banking and brokerage services.

We have defined *Information Industries* as industries that sell products that are made up mainly of information. In the search for representative cases, we are once again confronted by a potential source of confusion, since many of the firms involved in what we would classify as the information product segment are also involved in the more traditional methods of producing and delivering hybrid versions of their products. In the near term, it is practical to identify examples such as publishing, entertainment

(including print, video, and audio equivalents), or financial services.

2.4 Banking and Financial Services

Although new forms of pure Information-only Businesses may not yet have emerged, Banking and Financial Services clearly represent a case of an industry that, at least in part, is re-creating itself as what we would define as an information industry. Still, it remains difficult to precisely classify financial industries or sectors. For example, the 1993 report by l'INSEE (France's Statistics Institute) on services in France covered "heterogeneous activities, whose only common point is that they are neither industrial *nor financial (banks and insurance)*" (emphasis ours) [22].

Clearly, improvements in information management technologies enable banks and brokerage firms to offer new products and offset geographic restrictions. Important considerations in financial services industries have included time (e.g., float, payment processing, etc.) and information asymmetry (e.g., availability of information about capital markets). The revolution in information technologies is on the 'short list' of factors underlying the changing dynamics in financial industry structure and performance [12], but there remains a lack of systematic information and formal research regarding the nature and extent of the transformation [10]. Also, despite its status as a highly visible topic, adoption of the technologies has yet to occur on a widespread basis, according to available data. For instance: "as of June 30, 1998, less than 5 percent of commercial banks and less than 7 percent of national banks had transactional Web sites. While some Internet-based financial services, particularly discount brokerage, are having a dramatic impact on the market, Internet banking at this point is a relatively small factor in the banking industry." [10] Although the pace of change in the financial services industry has been dramatic: "even if recent growth trends accelerate somewhat, that would still result in a relatively small percentage of banks offering transactional Internet banking by the end of 1999." [10]

While a significant number of banking and financial service offerings are available in a form that we would classify as an information-only product, the consequences of their availability have not been studied to any significant extent [19][45], and we are reluctant to generalize or speculate based on the research that does exist. A recent Federal Reserve report shares this concern and concludes that, with respect to the banking industry: "studies of productivity, economies of scale and scope, and the effects of consolidation and technological change appear less reliable than previously thought. Similarly, studies comparing the efficiency of different banking organizations look questionable." [38].

3. Literature Review

We reviewed the available literature regarding business practices in Information Industries. As anticipated, the volume of research pertinent to Information Industries is somewhat limited. In the first section, we identify and critique different terminology and the underlying concepts to which they pertain. In the subsequent section, we summarize significant contributions in the literature regarding business practices relevant to Information Industries.

3.1 Definitions

No clear consensus exists regarding information products. We found different terminology with significantly different meanings. For example, “*digital products*” are defined as: “anything that one can send and receive over the Internet” [6]. The same authors proposed a taxonomy of digital products that is “meaningful in analyzing economic issues and developing business strategies” using five criteria. These criteria are transfer mode (delivered versus interactive products), timeliness (value is time-dependent or time-independent), intensity in use (single use vs. multiple use), operational usage (executable vs. fixed document), and externalities (positive or negative). Several of them, however, appear to have no distinctions at all: Transfer mode (web search: delivered or interactive?), intensity in use (stock quote flowing into a database: single or multiple use?) and operational usage (web page with graph-drawing applet: fixed or executable?).

A subset of these digital products has been referred to as “*Online Delivered Content*” (ODC) [29]. ODC is defined as any product that consists just of content (information) that is not embodied in a physical product, and can be sent and received over the Internet, with a process executed (or at least executable) via the Internet. Interestingly, the definition explicitly excludes *typical software programs or games* as part of ODC.

Similar, but broader in scope, is the term *information goods* [44]. These consist of anything that *can* be encoded as a stream of bits (emphasis ours), while recognizing the differences between information sold via a digital medium (e.g., Internet) and a physical medium (e.g., books). Different economic characteristics of information are recognized by this definition, including the large fixed, and sunk, cost to produce information, the negligible marginal cost to reproduce information, the notion that different customers value the same information differently, and the suggestion that information is an experience good (you have to experience it in order to

value it). Note that our definitions use the word “goods” only for the tangible parts of a product.

The term “*information products*” has described products provided in electronic or printed form [31], but this does not take into account the reality that the economics of information-only products are different from products that include information and a physical good as the medium.

The diversity in definitions is further demonstrated when others view the Information Age as a shift to the intangible [15] with ever-more important *intangible goods* [27]. Intangible goods are classified using various dimensions, based on [6], in three categories: buyer-related, seller-related, and delivery-process-related. Intangible goods include what we call services, which was the focus of [28], and what we call information. The economic differences between services and information are not made explicit in the framework in [27]. However, some important characteristics are included, such as perishability, complexity of use, (in)dependence on a medium, and network externalities.

To us it is evident that, with respect to basic terminology regarding Information Industries, there is not yet a clear consensus. For example, the term Information Industries has been defined [30] to broadly include computer equipment (a physical good), packaged software, “information services” such as consulting, and “information content.” In fact, this reveals a deeper issue regarding the ontology for information, information-only businesses, and Information Industries. There is no agreement about which elements to recognize and distinguish from one another.

Our view of product = good + service + information is based on a solid foundation of economic theory and recognizes important differences in the key characteristics of products. This view frames our literature search for business practices in Information Industries.

3.2 Business Practices

We found limited references regarding business practices that are relevant especially for Information Industries. We found some regarding business strategy, information systems development, and marketing of information products.

For Information Industries, *business strategies* such as “versioning” and “lock-in” have been proposed [44]. Versioning is adjusting the characteristics of information to emphasize differences in what customers value. Generally the high-quality version is produced first, and then features, i.e. value, are subtracted or disabled to get to lower-quality versions. Versioning recognizes that the marginal cost of an information product is near zero, and capacity to produce additional copies is practically unlimited. Therefore, in order to maximize profits, one

maximizes revenue, which can be done by selling to every customer who wants to pay at least some minimum. Lower-paying customers get less-powerful versions (which, however, may cost more to develop!).

“Lock-in”, also described in [32], is based on the concept of increasing returns: the more customers have adopted a product, the more potential customers will want the same product, and the higher the switching costs to another product. It is critical to get a large installed base fast, such as by initially giving away the product, or co-opting a competitor’s installed base, such as Excel being compatible with Lotus 1-2-3’s commands and file formats.

Based on the concepts of increasing returns and network externalities, “lock-in” may be achieved by a strategy of offering open but proprietary technology products, [32]. While such a strategy has been successful, for example, for Microsoft’s DOS/Windows, notable counterexamples are Sun Microsystems’ open but nonproprietary strategy for its workstations [13], and more recently, Sun’s similar approach for Java, as well as Netscape’s open source approach for its web browser.

A recurring business strategy issue for information is whether to market one-time purchases or subscriptions [31][44]. In the newspaper and magazine industry, current information is generally sold as subscriptions or is free on the Web. However, old information, for example, is sold per article at high prices. The Chicago Tribune, for example, sells old articles via the Web for \$1.50 per article, whereas a whole newspaper on any weekday costs \$0.50. On the other hand, current stock quotes are sold per subscription at very high prices, and old quotes (generally, older than 20 minutes) are available for free.

It is by now almost a cliché that competition in the Information Age is dynamic and very fast paced. Markets must be identified and exploited very quickly [31]. This makes it necessary for *information systems development* to be able to react fast. Information products and their variations can be engineered quickly based on a combination of a flexible repository combined with a highly automated “refinery”, i.e., adding value by converting, cleaning, standardizing, relating, or integrating incoming data. A “manufacturing” process for information products has been proposed, consisting of five stages: acquisition, refinement, storage/retrieval, distribution, and presentation/use [31]. Information products generated from a repository-refinery combination are more easily and dynamically recombined into new products, making the incremental cost of creating new products unusually low compared to physical products. Also product decomposition is easy, which also facilitates reintegration to create composite products. Customizability of the software development approach had a significant positive effect on process flexibility and process predictability, but reusability of software did not [33]. Furthermore, process flexibility was an important

determinant of competitive performance as perceived by both development managers and marketing managers.

Information Services, e.g., data center operations or applications development, are subject to make-or-buy decisions, just like other products. According to [35], managers are more likely to increase their level of outsourcing as changes in IS technology and skills become more rapid.

I.S. development in markets that compete “on Internet time”, i.e., change fast, has followed a “synchronize-and-stabilize” process [8][9]. Based on a stable architecture, new versions of a product are developed iteratively, with several intermediate milestones at which the product could be prepared for release, if market conditions dictate. Some suggest that information should be managed by an information product manager as a product with a life cycle [50]. Viewing information as a product leads to a focus on data quality, or the information’s fitness for consumer use (as opposed to the information system having no bugs).

A way of modeling information “manufacturing” systems has been proposed by [2] that tracks four attributes of information quality: timeliness, data quality, cost, and value. That technique can help to determine whether a reengineered system improves information quality. AT&T Bell Labs implemented *data quality* improvement efforts, see [40]. Empirical research into which data quality attributes are (most) important to those who use data, resulted in sixteen dimensions grouped into four categories: Accuracy, Relevancy, Representation, and Accessibility [51]. For software, an information product, and service support two satisfaction drivers out of seven were found to be critical for overall customer satisfaction: capability (i.e., features) and usability [25]. The importance of the seven drivers varied across customer and product segments.

Marketing of information products in “information intensive” or “smart” markets has received some attention in the literature. Information intensive markets exhibit “frequent turnovers in the general stock of knowledge or information embodied in products and possessed by firms and customers,” whereas “smart markets are dynamic, turbulent and information-rich” [14]. It is argued that information about its customers is the fundamental asset in contemporary information industries, such as data base marketing. Clearly, such firms face important issues related to ownership and privacy of customer information [5]. As we noted earlier, because supply of additional copies of information is essentially unlimited, optimizing revenue is a maximization problem constrained only by the customers’ willingness to pay, which depends on the value each customer is placing on the product. Because the marginal cost is essentially zero, each additional copy sold adds to revenues and profits. Consequently, aggressive pricing or steep discounting to sell additional

copies is a sensible pricing strategy. In marketing information products, intermediaries, or “infomediaries” [18], play an increasingly important role [23]. They filter and/or aggregate information for use by customers that may be organized in electronic communities [17]. Information intermediaries may also be instrumental in managing intellectual property, by ensuring payment of copyright or licensing fees [23].

4. Business Practices in Information Industries

Table 1 summarizes the business practices previously described. Consequently, we expect to see them actively used in Information Industries. In subsequent research, we intend to determine whether or not those business practices are in fact actively used in Information Industries. As described earlier, the objectives of our research are to study and comprehend the *differences* in business practices between Information Industries (selling products exclusively consisting of information) on the one hand, and industries selling services or physical goods on the other hand. The third column of Table 1 documents our expectation as to whether the business practices we described as especially relevant to Information Industries are in fact unique to Information Industries. Additionally, we intend to determine what business practices have not been researched, but are actively used.

5. Conclusions

Our research considers the differences in business practices between Information Industries and industries selling services or physical goods. Our research framework recognizes the different characteristics of goods, services and information, based on well accepted fundamental differences in their underlying economics. As a result, we add a much needed extension to the observation [39] that: “Goods are produced, services are performed” by noting that: “and information is recorded.”

In order to identify the business practices that are unique to Information Industries, we have begun by interviewing executives that have experience selling both information products and services or goods. These individuals are particularly able to compare the business practices in different types of industries.

Which business practices occur as the literature describes them? Which business practices occur that the literature has not (yet) recognized? Which ones are described in the literature, but not practiced? If not, why not? It was anticipated that major differences in business practices would be found. The interview phase of our research, currently in progress, has suggested that major differences do indeed exist in the business practices of firms in Information Industries. Further exploration of these differences will form the basis of hypotheses to be empirically investigated in future research.

Category	Expected Business Practices	Unique to Information Industries
Strategy	Versioning	Yes
Strategy	“Lock-in”	Yes
Strategy	Subscriptions vs. One-time purchases	Yes
I.S. Development	Manage repository + refinery	Yes
I.S. Development	I.S. development approach customization	No
I.S. Development	Outsourcing (when changes in I.S. technology and skills are rapid)	No
I.S. Development	Synchronize and Stabilize development process (when market change is rapid)	No
I.S. Development	Management of data quality	No
Marketing	Aggressive pricing, steep discounting	Yes
Marketing	Management of customer information	No
Marketing	Playing “infomediary” role	No
Marketing	Manage electronic communities	No

Table 1: Expected business strategies in Information Industries

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