I. INTRODUCTION & OVERVIEW

The Virtual University, Distance Learning, and the Project Tasks

The California Virtual University (CVU) is an initiative involving the California State University, the University of California, California Community Colleges, and several private universities and colleges in California which seeks to make higher education available to a broader range of individuals, both in the U.S. and abroad, by playing to strengths that California institutions of higher education have in communication technology. Numerous authors have suggested principles for such and undertaking; see, for example Johnstone and Krauth (1996), Dubois (1996) and Hopey and Ginsburg (1996).

The design team, created by an executive order of the Governor of California, has undertaken, among its first tasks, to determine the demand for services of the California Virtual University. Toward this end, a study of the secondary literature on demand for distance learning (Project 1) has been commissioned through the Center for California Studies at the California State University, Sacramento.

Specifically, the tasks under this project include:

1. identifying and summarizing the existing literature on potential future markets for distance learning in California and elsewhere;

2. analyzing the implications of the literature review by type of student (i.e., (i) traditional college-age students, (ii) older students who need to complete degrees, and (iii) the corporate market of employees seeking post-baccalaureate courses, certificates, and degrees), by type of academic program (e.g., engineering, liberal arts, teacher preparation), and the distribution of demand by geographic area.
Identifying the Literature on Distance Learning Markets

In undertaking the literature review, several electronic bibliographic databases, including EconLit, ERIC (Educational Resources Information Center), and the Expanded Academic Index, were searched. Since much of the literature on distance education and related topics is accessible only on the World Wide Web (WWW), the search included the use of several search engines (e.g., Infoseek, Yahoo! and Alta Vista). A survey of the directors of distance education at the top twenty distance education programs identified by Forbes Magazine (Gubenick and Ebeling (1997)) was also undertaken, to determine whether there was additional literature on demand that was not published.

Notwithstanding these efforts, the direct literature on the demand for distance learning is rather thin. The best of the literature consists of compilations of data from diverse sources which are suggestive of the demand for distance learning or the services of a virtual university. However, these sources do not go far beyond being suggestive. If attention is focused on rigorous studies of demand, these are in the nature of being studies of demand for higher education in general, not for distance learning. Thus, one is faced with a dilemma: studies of distance learning markets are not very rigorous, while rigorous studies are not of distance learning markets. The approach I have taken is to examine both strands of the literature, and infer what I can from each.

Generally, the result is gives a fairly coherent picture of the market for distance learning services. The greatest demand for such services is in work-related areas or those areas governed by licensing requirements. The greatest impediments to further advancement of demand have to do with accreditation and articulation, not with computer technology. The technology is now pervasive in high school classrooms, and so the
market is likely to grow as more students already familiar with techniques of distance learning come “on line.”

The international demand is difficult to gauge. A number of countries have developed significant distance learning capabilities, and studies support the idea that students prefer to obtain distance education from “home” institutions. This reinforces the idea that any provider of distance education must define his niche in the market (as suggested by the theory of monopolistic competition discussed below).

**Classifying the Literature**

I classified the literature identified into the following categories.

1. Studies of the Domestic Market for Distance Learning
2. Studies of the Overseas Market for Distance Learning
3. Studies Estimating the Demand for Higher Education in General
4. Sources of Data on Distance Education and Demand for Higher Education

The remainder of the report is organized as follows. Section II reviews key economic concepts in the analysis of the market for distance learning; Section III reviews studies of the domestic market for distance learning; Section IV reviews studies of the overseas market for distance learning; Section V reviews studies which estimate the demand for higher education in general; Section VI discusses sources of data on distance learning; Section VII discussed additional considerations; Section VIII concludes.

**II. KEY ECONOMIC CONCEPTS IN THE ANALYSIS OF THE MARKET FOR DISTANCE LEARNING**
In this section the key economic concepts connected with the idea of distance learning, including scale economies, input substitution, and product differentiation in a monopolistically competitive market, will be reviewed. One of the main attractions of distance learning is that the cost of providing services is expected to be reduced. This would permit charging a lower price which would increase the quantity demanded of educational services. Turoff (1997) claims, for example, that a virtual university serving 2,000 students would cost less than constructing a single classroom building on a college campus (about $15 million). The first two items to be discussed - scale economies and input substitution - are factors which suggest that distance learning could lower the price and thereby increase the quantity demanded of educational services. The theory of monopolistic competition provides a framework for understanding the relationship between demand for distance learning in general and the demand for the distance learning services of a particular provider. Then the determinants of demand will be systematically discussed.

**Fixed Costs and Scale Economies**

Scale economies occur when the average (or unit) cost of production decreases with the level of production. One source of scale economies is an indivisibility in the use of an input - the idea that some input in the production process is “lumpy,” i.e., it cannot be made smaller. Many aspects of higher education exhibit scale economies. The average cost of a college class decreases with the size of the class because most of the costs associated with the class are in the nature of fixed costs. For example, a lecture must be prepared for the class whether there are 1 or 10 or 100 students in the class. If there is only one student in the class, the average cost of the lecture is just the cost of the
lecture divided by one student. If there are 100 students in the class, the average cost of
the lecture is the fixed cost of the lecture divided by 100.

In traditional classes scale economies of the sort mentioned above are limited by
the size of the physical classroom. With distance learning the potential exists to distribute
the fixed cost of lectures across a much larger base of students. Evidence of scale
economies is discussed in Arvan (1997, 6). For the spring 1996 semester there were 10
courses with enrollments over 800 at the University of Illinois at Urbana-Champaign
(UIUC), with the largest having an enrollment that exceeded 1700. Personnel costs per
student were 200% higher for median-sized courses at the UIUC than for these large
enrollment courses.

**Input Substitution**

Input substitution refers to the practice of altering the combination of inputs used
to produce an output in response to a change in the relative prices of inputs or to
technological change. For example, distance learning itself already constitutes a kind of
input substitution - of one kind of physical capital (computers) for another kind of
physical capital (classrooms). Arvan (1997) also discusses input substitution, specifically
the substitution of faculty and teaching assistants (TAs), and how the possibilities for such
substitution may be affected by distance learning. The theory of input substitution
assumes that the *same* output is produced. In practice, however, it may be that quality is
affected by input substitution. For example, when teaching assistants are substituted for
faculty, quality may change.
Product Differentiation in a Monopolistically Competitive Market

In some of the studies discussed below, demand has been estimated for a particular institution or program. In these case variables have been employed designed to gauge the effect of competition by other programs or institutions. In all cases, some “alternative” to attendance at a particular program has been modeled.

Economists study various kinds of market structures, for example, perfect competition and monopoly. The market structure that appears to be most suitable to the analysis of the market for distance learning is monopolistic competition (see, for example, Graham (1980, pp. 341-345)). The central elements of this theory are as follows. There are many competing suppliers of similar, but not identical products. Entry of potential suppliers into the market is easy. Each supplier seeks to find his niche by producing a product which is different from those of competitors. This product differentiation gives each supplier some degree of market power, i.e., some strategic influence over the price. In the short run, firms in a monopolistically competitive market earn “super-normal” (or “economic”) profits. In the long run, easy entry means that the economic profits are dissipated. Firms in a monopolistically competitive market earn only “normal” profits in long run equilibrium.

At first blush the market for distance learning services appears to be monopolistically competitive. There are many suppliers. Entry is easy, as evidenced by the numerous private firms providing specialized training for corporations over the World Wide Web (WWW). The key to earning profits in the short run in a monopolistically competitive market is to distinguish one’s product from that of competitors. So long as there are not sufficiently close substitutes to the product, the firm continues to earn
firm continues to earn “super-normal” profits. For many monopolistically competitive firms the main distinguishing feature is location. For example, some economists consider the video cassette rental business to be monopolistically competitive. People often rent video cassettes from the nearest location. But location is not a basis for distinguishing digital distance learning services. The point of distance learning is to make location irrelevant (or less relevant). Whether location is completely irrelevant depends on the nature of the program.

Based on a review of some syllabi for the upcoming CSU Virtual Summer School (see Appendix 1), location will be a factor for some courses, since students will be required to come to the campus for some examinations. Most offerings of the Virtual Summer School that require a campus visit limit the number of such visits to two or three. Such courses, however, cannot be accessed by students who are very far away.

It is important to note that the design committee was established in conjunction with Governor Wilson’s decision not to join the Western Governors’ University (WGU). The WGU has just been incorporated, and has received over $2 million in funding. In conception, the WGU is different from the early plans for the CVU. But the theory of monopolistic competition suggests that it is vital to distinguish the CVU from all competitors, not just the WGU.

**Determinants of College Enrollment and the Demand for Distance Learning**

The nature of distance learning within the context of the California Virtual University needs to be understood before the discussion of determinants of demand. Distance learning includes at least the following features.

(1) Less frequent face-to-face contact;
Use of technology, e.g., VCRs, cable television, and computer terminals;

Decreased supervision;

Lower access to library resources.

Mayadas (1997) gives five criteria for evaluating the success of an asynchronous learning network (ALN). These are:

1. whether there is, in fact, more access:
2. whether learning effectiveness has increased;
3. whether faculty satisfaction has increased;
4. whether the program is cost effective;
5. whether student satisfaction has increased.

The characteristics of distance learning affect the degree to which the criteria outlined by Mayadas are satisfied. The cost effectiveness of distance learning depends on the fixed cost of the course and on the degree of market penetration. Whether there is an increase in learning effectiveness depends on the degree to which learning effectiveness depends on close supervision.

Part of the rationale for the creation of the California Virtual University is to respond to “Tidal Wave II” - an increase in the population of traditional college-age students. The literature on economics includes several recent studies (Schwartz (1985), Paulsen and Pogue (1988), Kane (1994)) which model enrollment and test hypotheses about college enrollment. Modeling enrollment in traditional programs is important for discussing the demand for distance learning for several reasons. First, increased access to distance learning may be either a substitute for traditional programs or it may be a complement to traditional programs. Second, the studies of enrollment in traditional
programs enlighten discussion of the demand for distance learning because they can be used to quantify the effects of such factors as distance from the campus as a deterrent to traditional enrollment.

In discussing the demand for distance learning it is important to identify the areas and levels of education for which distance learning is suitable compared with traditional learning. The demand for distance learning will then depend on the demand for these areas and levels of education. The discussion of the determinants of the demand for distance learning will be divided into two categories: traditional determinants of demand, and determinants of demand specific to distance learning. The traditional demand determinants include:

**Traditional Determinants of Demand**

a. *Income.* The concept of the income elasticity of demand is important in discussing the demand for distance learning. Goods for which demand increases when income increases are called *normal goods.* Goods for which demand decreases when income increases are called *inferior goods.* It is not apparent whether distance learning is a normal or an inferior good. If distance learning is a normal good, and if we project income to increase over the next ten years, we would predict an increase in demand for distance learning. If on the other hand distance learning is an inferior good, then an increase in income would have the opposite effect on demand for services. If we also knew the income elasticity of demand for distance learning,¹ we would be able to quantify the predicted change in demand.

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¹ See discussion of elasticity in Section VI below.
b. *A good’s own price.* Generally, the higher the price of a good, the lower is the quantity demanded. The own price elasticity of demand is a measure used by economists to estimate the sensitivity of quantity demanded to changes in a good’s own price. This concept is also important in discussing demand for distance learning. If the price of distance learning services declines as a program increases enrollment (due to the effects of scale economies), the increase in quantity demanded could be quantified if the own price elasticity of demand is known.

c. *Prices of substitutes and complements.* These will determine the quantity demanded of distance learning compared with the quantity demanded of traditional learning. Suppose distance learning and traditional learning are substitutes, and the relative price of distance learning falls compared with the price of traditional learning. Then demand for traditional learning services will decline. However, distance learning may make possible increased access in introductory courses, leading to increased enrollment in advanced courses. In this sense, distance learning can act as a complement to enrollment in traditional courses. This effect can be quantified if we know the cross-price elasticity of demand of traditional learning services for distance learning services.

**Determinants of Demand Specific to Distance Learning**

d. *Accreditation of Distance Learning Degree Programs.* Existing distance learning components may not be accredited, or if accredited, they are accredited by different organizations, and as a result the perceived quality and usefulness of credits earned under these existing programs differs (Weisberg and Ullmer (1995)). It is possible by systematic study of the accreditation of existing programs to gauge the significance of
accreditation to the growth of the distance learning program, but no study has
undertaken such a systematic investigation of the effects of accreditation on demand
for distance learning.

e. **Articulation of Distance Learning Program Credits.** Likewise, whether the credits
erned under a distance learning program are readily accepted in other programs
affects the potential growth of the program. Both accreditation and articulation are
discussed at length in Schweiger (1994), but no specific data are provided to gauge the
effect of these factors.

f. **Widespread Use of Home Computers.** Depending on the degree to which a particular
distance learning program depends on home computers, the market penetration of
home computers may determine the degree of market penetration of distance learning.

g. **Degree of Complexity of Work Tasks Requiring Frequent Retraining.** Employees may
require frequent updating of skills in a rapidly changing technological environment,
and distance learning may be an appropriate response. This is evidenced by a number
of high-quality engineering programs with significant distance learning components,
e.g., Stanford University’s program; see Bourne, et al. (1997).

h. **Degree of Career-changes in the Future.** Some have argued that workers in the future
will undergo frequent career changes compared with workers in the past. If this is so,
it will impact the demand for distance learning. The more frequent the need to change
careers, the more will be the demand for at least some distance learning to acquire the
skills required by the new career.
III. OVERVIEW OF THE DOMESTIC MARKET FOR DISTANCE LEARNING

Several publications provide overviews of distance learning, and enlighten the question of the demand for services of a virtual university. These sources will be reviewed in this section.

*Educational Media and Technology Yearbook,* published in cooperation with the Educational Resources Information Center (ERIC) and the Association for Educational Communications and Technology, contains several papers on trends and issues in educational technology. The most directly relevant to the demand for distance education and the services of a virtual university is a paper by Donald P. Ely entitled “Trends in Educational Technology 1995.” This paper uses “content analysis” to identify trends in educational technology. Content analysis uses the frequency with which particular topics are mentioned in leading sources in a given field to identify trends in the field. Ely identifies the following trends in 1995.

*Trend 1.* Computers are pervasive in schools and higher education institutions. Virtually every student in a formal education setting has access to a computer.

*Trend 2.* Networking is one of the fastest growing applications of technology in education.

*Trend 3.* Access to television resources in the school is almost universal.

*Trend 4.* Advocacy for the use of educational technology has increased among policy groups.

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3 A monograph with the identical title published by ERIC in 1996 is an abbreviated version of the paper published in *Educational Media and Technology Yearbook,* see Ely (1996).

4 Similar studies based upon content analysis were carried out in 1988, 1989 and 1991.
**Trend 5.** Educational technology is increasingly available in home and community settings.

**Trend 6.** New delivery systems for educational technology applications have grown in geometric proportions.

**Trend 7.** There is a new insistence that teachers must become technologically literate.

**Trend 8.** Educational technology is perceived as a major vehicle in the movement toward education reform.

Ely (1997, 20) argues that the trends observed in 1995 are a continuation of those observed in the earlier studies of 1988, 1989 and 1991. Instructional processes have remained in the first position, followed by technological development in second or third place in each of the four studies. Ely writes, “More obvious is the increasing use of distance education to provide resources that are not available in a local school. Distance education requires a means or medium to make it work. Satellite and cable television, along with computers and networks, provide the means. … The impact on learning is still unclear.”(p. 21)

These trends suggest that distance learning will become increasingly common in higher education because the pool of prospective students have already been exposed to distance learning techniques and technology. Almost all U.S. students have had some exposure to media and computers in education. Computer use is increasingly common in the home and at school.
Lifelong Learning Trends, a publication of the National University Continuing Education Association, provides a comprehensive picture of continuing education and distance learning and related trends. The report discusses six topics:

(1) Factors contributing to the growth of distance learning;
(2) Characteristics of students of distance learning;
(3) Financing of continuing education;
(4) Preparing for the global economy;
(5) Specialized continuing education programs;
(6) Instructional technology.

I will review the discussion of each of these topics below.

Factors Contributing to the Growth of Distance Learning

Lifelong Learning Trends examines the role of each of the following factors as contributing to the growth of distance learning.

(a) The growth of part-time students. Part-time students are the fastest growing population in higher education. Based upon statistics compiled by the National Center for Education Statistics, between 1970 and 1995, the number of part-time student enrollments at American colleges and universities increased from under 3 million to an estimated 6.7 million. This is an increase of 139%, compared with a 44% increase for full-time enrollment.6

(b) Changing composition of the U.S. civilian labor force relative to labor demands. The labor force will consist increasingly of older workers,

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with a greater percentage of workers who are members of ethnic or racial minorities and an increasing proportion of women. It is expected that the educational and training requirements for those beyond the traditional postsecondary education age will increase as jobs become more technological in nature. The report states that three of four jobs today require some postsecondary education. Furthermore, job growth is greatest in occupations requiring more education.7

(c) *Tuition costs continue to outpace inflation.* In 1970 only 12% of the U.S. population aged 25 and older had college degrees. By 1994 the figure was 36%.8

(d) *Individuals who have more education have higher earnings.* In 1992, mean annual earning of college graduates were more than twice that of high school graduates. Those with professional degrees earned more than twice as much over a lifetime as those with bachelor’s degrees.9

(e) *About 40% of the adult population participates annually in continuing education activities.* This figure includes work-related, enrichment, credential, apprenticeship, ESL and Basic/GED programs. About eleven million adults took credential courses.10

(f) *The pool of traditional college-age students is projected to increase.*

From 1975 to 1994 the number of high school graduates declined each

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6 *Lifelong Learning Trends*, op. cit, p. 3.
8 *Lifelong Learning Trends*, op. cit., p. 6-7.
year, although higher education enrollments increased in this period. This is explained mainly by two factors. First, the college enrollment rate of traditional college-age students was increasing, and, second, the number of nontraditional-age students also increased. Starting in 1994 (and projected to the year 2005) the number of high school graduates will increase to more than 3 million. The figure for 1995 was less than 2.4 million.

(g) Other demographic factors suggest increased growth of distance learning. An increasing number of families are headed by single women, and the older adult population is increasing rapidly.\(^\text{11}\)

The implications of these factors for market for distance learning and the demand for services of a virtual university are the following. Because there will be a substantial increase in the pool of traditional college-age students by the year 2005, if tuition costs of traditional higher education continue to outpace inflation in the future as they have in the past, and if distance learning and the services of a virtual university can be offered at a lower relative price to traditional higher education, these services can be expected to capture an increasing share of the 600,000 additional college-age students by the year 2005. How large this additional share might be would depend on elasticities of enrollment with respect to tuition, discussed below.

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\(^{\text{10}}\) Lifelong Learning Trends, op. cit., p. 9.

\(^{\text{11}}\) Lifelong Learning Trends, op. cit., p. 12, 15.
Characteristics of Distance Learning Students

The following characteristics of students are discussed in *Lifelong Learning Trends.*

(h) *Part time students are primarily women.* The distribution of part-time enrollments by age and gender shows that 56% of part-time enrollment in the 18-24 year old age range are women. This rises to 66% in the 35 years of age and older category, based upon data from the fall of 1993.\(^{12}\) See Table 1.

(i) *Most part-time students attend public two year institutions.* The ratio of part-time to full-time students at public four-year colleges is 0.43, whereas the ratio of part-time to full time at public two year institutions is 1.83.\(^{13}\) See Table 2.

(j) *Most university distance students are served by public in-state institutions.* *Lifelong Learning Trends* summarizes the results of a study by SRI International showing the percentage of institutions with 50% or more of technology based distance education students by distance from campus and type of institution.\(^ {14}\) See Table 3.

(k) *Nearly half of all minority college students are part-time.* Part-time enrollments for Hispanics and Native Americans are 50%, while for African Americans the figure was 42%. The figure for whites was 43%.\(^ {15}\)

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(l) Business-related areas predominate in post-baccalaureate certificate programs. Data on certificate awardees from 1986-87 shows that business and management areas, followed by education, predominated in certificate programs. These programs accounted for 83% of all certificates awarded.\textsuperscript{16}

(m) A Majority of master’s degrees are awarded to part-time students, while the majority of professional degrees are awarded to full time students. About 90% of first professional degrees were awarded to full-time students, while 61% of master’s degrees were awarded to part-time students.\textsuperscript{17}

There are several implications from these facts for the market for distance education and the services of a virtual university. That most distance university students are served by public in-state institutions suggests that technology notwithstanding in-state institutions have a marketing advantage in what may be considered the “home” market. The areas where distance education certificate programs have been most successful are business followed by education. The latter probably is driven by licensing requirements for continuing education, while the former probably is tied to the job-relatedness of the certificate. Areas which are closely tied to workplace needs or licensing requirements would seem to be the areas most likely to exhibit high demand for distance learning and virtual university services. This is not to suggest, however, that these areas are the only ones suitable for distance education. Hawisher and Pemberton (1997) discuss implementing “writing across the curriculum” in an asynchronous learning network.

learning network. Also, Appendix 1 shows some of the diversity of offerings by discipline in the CSU Virtual Summer School.

**Financing of Distance Learning**

In discussing the financing of study, *Lifelong Learning Trends* points to several factors. In a survey of 1,865 member companies of the International Foundation of Employee Benefit Plans, 91% offered tuition reimbursement in 1990. Based upon a 1993 survey by the same organization, the level of employer support varied depending on the type of expense. Almost all employers surveyed provided tuition support, but some provided support for expenditures on books, supplies and equipment, and even lodging and meals. Higher levels of support for education expenses are more common in service industries.\(^{18}\) See Table 4. Since the service sector has been the fastest growing sector of the U.S. economy, this suggests that employer support for distance learning will expand.

**The Future of Distance Learning**

A variety of factors identified in *Lifelong Learning Trends* suggests that the role of continuing and distance education will be changing. The study points out that more immigrants with professional credentials are being admitted into the U.S. At the same time various states mandate continuing education in a variety of professions, including architecture, certified public accountants, dentists, lawyers, nurses, etc. There are indicators of growth in continuing education programs, including an expansion in the number of master of liberal arts programs, and programs for adults of retirement age. Although the number of master of liberal arts programs is growing, this trend seems inconsistent with the increasing technological nature of the workplace, and distance

\(^{17}\) *Lifelong Learning Trends*, op. cit., p. 27.

learning driven by the need for retraining. Master’s of liberal arts are often marketed to students who shy away from more technically oriented majors.

**Distance Learning and Instructional Technology**

Finally the study points to the expansion of instructional technology. About one in six adults owned a personal computer in 1994, and three million plug-in CD-ROM drives for personal computers were sold in 1992. Internet access is increasing (see Table 5) and an increasing percentage of adults receive work-based education via media (see Table 6). The majority of public universities offer distance education, and an increasing number of courses use educational technology (see Tables 7 and 8).

**Distance Learning and Workplace Productivity**

*The Knowledge Connection,* another publication of the National University Continuing Education Association that overviews distance education, argues that two central facts in the marketplace drive the development of work-related distance education: knowledge is becoming more important in employment, and the workforce will continue to diversify. These facts imply that distance learning will be an increasingly important aspect of economic development. The remainder of the book argues that 1) learning must be continuous; 2) continuous learning requires changing the status quo; 3) employer-provided training is no substitute for education; 4) technology will continue to influence all aspects of continuous learning.

**IV. OTHER STUDIES OF DOMESTIC MARKETS FOR DISTANCE LEARNING**

I will review first an unpublished study of distance education demand conducted by Washington State University, and then review several published studies.
Unpublished Study

The unpublished study, “Washington State University Extended Degree Survey,” by Extended University Services and the Social and Economic Sciences Research Center, Washington State University [WSU] (cited as Hanna (1992), is based upon a survey of several hundred households in Washington State. The main highlights of the survey are the following:

- There is a significant difference in higher education participation between the rural and the state-wide sample. Thirty-seven percent of the rural sample had never attended college, while only 22.5% of the state-wide sample had never attended college;
- Of the 2.6 million individuals state-wide who had attended college in the past, less than half have completed a degree at the associate level or above. Approximately 286,000 have completed an associate degree but have not completed a baccalaureate degree.
- An estimated 1.1 million individuals statewide (173,000 rural) would be interested in pursuing a baccalaureate degree offered through distance education. The main reason cited by respondents for their interest was being able to study without leaving home or relocating.
- The degree program through distance education is of interest to minorities in accordance with their percentage in the general population and is of interest to a higher percentage of minorities than whites living in rural areas.

Responses to two questions in the survey are of particular interest for the purposes of this review. Question 14 asked whether anyone in the household would be interested in a program designed to complete the final two years of a degree through distance education. In the statewide sample, 45% of the respondents reported one or more persons interested in the WSU degree program. This result suggests that some 1.12 million people statewide would be interested in such a program. The percentage of respondents in the rural sample was lower (38.7%).

19 A copy of the study was provided to me by Muriel K. Oaks, Ph.D., Director of Extended University Services at Washington State University, in response to my survey of directors of top twenty distance education programs.
The WSU study also asked individuals who were not interested in the specific social science degree program then contemplated by the university to identify the area of study in which they would be most interested. The responses were as follows.

<table>
<thead>
<tr>
<th>Area</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>23%</td>
</tr>
<tr>
<td>Engineering</td>
<td>13%</td>
</tr>
<tr>
<td>Arts and Humanities</td>
<td>10%</td>
</tr>
<tr>
<td>Education</td>
<td>10%</td>
</tr>
<tr>
<td>Nursing</td>
<td>8%</td>
</tr>
<tr>
<td>Physical Sciences</td>
<td>4%</td>
</tr>
<tr>
<td>Vet Medicine</td>
<td>2%</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>2%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>24%</td>
</tr>
</tbody>
</table>

This study provides very useful information on the demand for distance education services. First, it tells us that demand is likely to be higher in urban areas. Second, the listing of fields of greatest interest for those most likely to attend distance education programs seems to confirm other studies in suggesting that business and professions involving licensing or the need for very current information are the strongest areas for distance education.

**Published Studies**

The most important study in this category is the study of Ory, Bullock and Burnaska (1997). While the focus of the study is on gender differences in the use of an asynchronous learning network in a university setting, the study is based on a samples of thousands of students involved in a total of 40 courses during the 1995-96 academic year at the University of Illinois, Urbana-Champaign (1,118 students in 17 courses in the Fall semester and 1,033 students in 23 courses in the Spring semester). The authors present data on the gender and ethnic background of the respondents, on the frequency of their use of asynchronous learning networks (ALN) by gender, on attitudes about computer use
use by gender, on where students were using the computer by gender, and on the students’
evaluation of the courses by gender. In general, the data show few differences between
male and female respondents on a variety of measures of use of and acceptance of
asynchronous learning.

Although this study is not itself a demand study it can potentially be combined
with other data to obtain some information on the determinants of demand. For example,
data can be gathered on the number of students at the University of Illinois, Urbana-
Champaign enrolled in traditional courses in the 1995-96 academic year. Then the
“market penetration” on the ALN courses can be determined. More significantly, the
study suggests that male and female students do not differ much in their potential for use
of distance learning, so accounting for gender of the target population may be less critical
in making estimates of the market demand for distance learning and the services of a
virtual university.

The paper by Mayadas (1997) provides an overview of ALN programs, and gives
a listing (his Table 2, p. 14 reproduced below as Table 9) of ALN programs supported by
the Sloan Foundation. The programs are divided into three categories: On-campus, Near
Campus, and Very Far From Campus. There are seven On-campus programs, twenty
Near Campus Programs and eight Very Far From Campus programs. Of these programs,
seven are deemed to have the potential for more than 1,000 enrollees per year.

The paper by Green (1996) contains much useful statistical information related to
demand for distance learning. Green is director of the annual Campus Computing survey.
He cites overall statistics on the growth of information technology on campus. For
example, he notes that some 16 million people (students and faculty) now have some
“recurring instructional experience with information technology resources and technology based learning activities” (Green, 1996, p. 24). Green also provides detailed tables on the percentage of college courses using various kinds of information technology (for 1994 and 1995), user support issues, the percentage of college course using commercial courseware, and the percentage of college courses using computer labs for teaching and instruction. Green’s charts are reproduced as Figures 1a and 1b below.

**STUDIES OF OVERSEAS MARKETS FOR DISTANCE LEARNING**

The core of the studies of overseas markets for distance learning are two reports commissioned by the Organization for Economic Cooperation and Development (OECD). The OECD is an international organization of developed counties, mostly in Europe. The focus of both OECD studies is on the impact of distance learning for economic development. *The Future of Post-Secondary Education and the Role of Information and Communication Technology: A Clarifying Report* is a policy study by the OECD which examines the “triple challenge”: accessibility, quality and costs.

The report reviews a number of efforts in the member countries of the OECD to increase distance learning. Concerning the triple challenge the report concludes that “Adults, many of them using study centres, would be able to participate in courses of study that feature strong emphasis on project-based collaborative learning …” (p. 40). Regarding cost the report concludes that little is known about the effect of increasing distance learning upon costs per graduate.

The report also examines the “missing links” of distance learning. These are the new structures that need to be built to respond to the triple challenge. They include considerations such as centralizing some functions of organizing and presenting a course,
development of study centers, by which the authors of the report mean, centers where
distance education students meet face-to-face.

A subsequent report by the OECD, *Learning Beyond Schooling: New Forms of Supply and New Demands*, offers both anecdotal and statistical evidence concerning the
development of distance learning. Figures 2a and 2b give some examples of initiatives in
distance education in various regions of the world. Figure 3 gives some crude data on the
development of distance education in various parts of the world.

**VI. STUDIES ESTIMATING DEMAND FOR HIGHER EDUCATION**

**The Concept of Elasticity**

In the studies reviewed below, we will encounter several estimates of *elasticities*. These are measures of how sensitive one variable is to changes in another variable, stated in terms of percentage changes in each of the variables. Elasticities are critical to economic analysis and critical to the analysis of the market for distance learning. To illustrate, one way to derive implications about the market for distance learning services is to determine the elasticity of enrollment in traditional courses with respect to physical distance from the campus. This elasticity is the percentage change in enrollment in traditional classes for a 1% change in physical distance. Estimates of this elasticity are negative, i.e., there is a certain percentage decrease in enrollment in traditional classes for each percentage increase in distance from the campus. Since this elasticity (like other elasticities) is estimated holding other factors constant, the estimated elasticity allows us to gauge the number of students deterred from enrolling solely by the increase in physical
distance (cost of commuting). This can serve as an estimate of the potential number of students to be served by a distance education program.

**Statistics and Regression Analysis**

Some of the studies below use a statistical technique called regression analysis to analyze demand for higher education. Regression analysis is the tool of empirical analysis most commonly used by economists. It permits the analysis of the effects of one variable upon another *holding constant* the effects of other variables. Generally, regression analysis involves fitting a line (or with several explanatory variables - a plane) to data about these variables in order to infer the relationship among the variables. The regression method results in the estimation of coefficients of a regression equation. These coefficients are then tested to determine whether they are statistically distinguishable from zero (statistically significant).

**Demand for Higher Education**

Schwartz (1985) estimates a binomial logit regression of the enrollment decision based upon a multiperiod utility maximization model. Previous models used either utility maximization in the period immediately after high school graduation or lifetime wealth maximization. The data employed are the 1980 High School and Beyond (HSB) survey of 28,240 high school seniors (of which 11,500 observations have complete information for the variables used in this analysis), and the March 1980 Current Population Survey.

Estimation results of the study are presented in Schwartz’s Table 2, p. 136, reproduced as Table 10 below. Included are two variables which inform the question of the demand for distance learning. The “direct cost” is the cost of tuition, materials and fees of attending college, while the variable “distance” is the distance in miles from the
nearest public four-year college. These variables have the expected effect on the probability of attending college, namely both are negative and statistically significant. These results can be used to infer something about the demand for distance education because distance education can be expected to decrease the direct cost of college, and also to decrease the commuting cost. The coefficient estimates reported by Schwartz can be used to make estimates of the demand for distance education services based upon the reduction of direct cost and reduced commuting cost.

Using a sample of high school seniors in the National Longitudinal Survey of the High School Class of 1972, Savoca (1990) estimates the price elasticity of the decision to apply. The paper uses a discrete-choice model which has been used in previous studies, but those studies treated the decision to apply as exogenous, ignoring the effect of a change in tuition on the applicant pool. Results are presented in her Table 2 (p. 127), giving the simultaneous estimates of three equations: the decision to apply equation, a cost equation, and a college quality equation. The study holds some implication for distance learning in that cost relative to income is negative and statistically significant in the decision to apply equation. It is important to note that this coefficient is negative holding constant quality.

Paulsen and Pogue (1988, 275) develop a model in which demand for college is viewed as derived demand based upon demand for human capital. The human capital approach is a standard one used in economics for analyzing demand for education. Education is viewed as an investment that pays dividends into the future; the size of these dividends determines whether the investment is worthwhile. See also Glytsos (1990). The demand (enrollment) regression equation for a particular college is presented in log-
presented in log-linear form (Paulsen and Pogue (1988, 276)) as:

\[ E_{it} = a_i + g_i t + B_1 X_{1t} + B_2 X_{2t} + B_3 X_{3t} + B_4 X_{4t} + B_5 X_{5t} + B_6 X_{6t} + U_{it}, \]

where,

- \( E_{it} \) = total undergraduate enrollment at the ith college in year t, measured as the headcount of fulltime and part-time students enrolled in the fall term,

- \( X_{1t} \) = beginning monthly earnings of college graduates divided by the consumer price index, a measure of conditions in the labor market for college graduates (LMCG),

- \( X_{2t} \) = average monthly earnings of full-time US workers divided by the consumer price index, a measure of income opportunities foregone while attending college,

- \( X_{3t} \) = annual tuition plus mandatory fees divided by the consumer price index, a measure of the direct costs of attending the ith college,

- \( X_{4t} \) = total enrollment at all public institutions of higher education in Iowa and Illinois divided by total independent college enrollment in Iowa and Illinois for each year of the sample period, a measure of the competition from public colleges and universities that led to the expansion of the public sector relative to private sector college enrollment,

- \( X_{5t} \) = total number of inductions into the armed services divided by the population of 18-26 year olds in the US, a measure of military draft pressure, which may provide motivation to attend college,

- \( X_{6t} \) = resident population of 18-24 year olds in Iowa and Illinois,

- \( U_{it} \) = an error term.

The Bs are elasticities, and a and g are college-specific factors (see Paulsen and Pogue (1988, 276)). For example, \( B_1 \) is the elasticity of enrollment with respect to the starting real monthly salary of college graduates, i.e., the percentage change in enrollment for a one percent change in real monthly starting salary. The focus of the Paulsen and Pogue (1988) study is on whether elasticity of enrollment with respect to the labor market for college graduates (LMCG) depends on characteristics of the college (specifically on selectivity and curriculum), which they represented by modeling \( B_1 \) as a function of those
function of those factors, i.e.:

\[ B_1 = A_0 + A_1Y_{1it} + A_2Y_{2it}, \]

where,

- \( Y_{1it} \) = fraction of total bachelor’s degrees conferred by the ith college in period t in nontraditional occupational fields,
- \( Y_{2it} \) = dummy variable; 1 for selective college, 0 for non-selective college,
- \( A_0 \) = elasticity of enrollment of nonselective college conferring no degrees in occupational fields,
- \( A_1 \) = effect of occupational studies on elasticity of enrollment with respect to conditions in LMCG,
- \( A_2 \) = effect of selectivity on elasticity of enrollment with respect to conditions in LMCG,

This gives,

\[ E_{it} = a_t + g_t + A_0X_{1it} + A_1Y_{1it}X_{1it} + A_2Y_{2it}X_{1it} + B_2X_{2it} + B_3X_{3it} + B_4X_{4it} + B_5X_{5it} + B_6X_{6it} + U_{it}. \]

Paulsen and Pogue (1988) estimated this equation using data on enrollment at 64 independent colleges in Iowa and Illinois, 1965-1981. The focus of their analysis is on the question of whether the sensitivity of enrollment to labor market conditions depends on the selectivity of a particular college and on its curricular emphasis. Since distance learning seems to be expanding largely in non-selective colleges, and the focus of such distance education programs is likely to be in business or areas involving professional licensing, the results of Paulsen and Pogue are cautionary. They tell us that there is no single dominant “strategy” in terms of curriculum and labor market conditions which a college can choose to maximize enrollment.

Kane (1994) studied the enrollment pattern of black 18-19 year old high school graduates. He presents data on college enrollment rates of 18-19 year old high school
graduates by race, average tuition, room and board, Pell grants and net cost for a representative black youth attending a four year public university. Kane’s Table 1, p. 885 (reproduced as Table 11) gives public four year comprehensive university tuition for in-state students by state (1988 dollars) for 1980-81 and 1988-89. He also presents high school graduation rates by race.

Kane estimates high school graduation regression equations (Table 2, pp. 888-89) for blacks and college attendance equations by race (with a variety of specifications) (Tables 3 and 4, pp 894-95 and 896-97). The specification include various measures of cost, including net cost, tuition, Pell grants, net cost interacted with family characteristics, and returns to college. The focus of the study is explaining the enrollment pattern of blacks and the effect of financial aid on enrollment.

Kane’s results inform the analysis of the market for distance learning, because he separately estimates the effects of an increase in direct cost of college for blacks and for whites. An increase in net direct costs reduces enrollment of both groups, but has a stronger negative impact upon blacks than upon whites. This suggests that other factors held constant, blacks would benefit more from increased distance learning if the effect of distance learning were to decrease the net direct cost of education. (The negative effect of increased net direct costs is about 45% stronger for blacks than for whites.)

VII. DATA ON DISTANCE LEARNING

Data useful for estimating demand for distance learning arises from several sources. Some is reported in studies of demand or in studies of another aspect of distance learning, and can be adapted to a study of demand. Some data useful for estimating
demand arises in the course of evaluating distance learning programs. Finally, specially constructed surveys can be used to generate data specifically to estimate demand for distance learning.

The most comprehensive source of statistics on education in general and distance learning in particular is the National Center for Educational Statistics (NCES), an agency of the U.S. Department of Education. As the federal agency charged with gathering statistics on all aspects of education, primary, secondary and post-secondary, the NCES conducts several surveys relevant to the study of distance learning markets. One of the NCES’s publications is *Projections of Education Statistics*, which provides projections of enrollments, completions, degrees conferred, instructional staff and expenditures in elementary, secondary and post-secondary institutions. Data on high school completions, and projections of enrollment at two- and four-year colleges would be especially relevant to studying the market for distance learning.

The National University Continuing Education Association’s publication *Lifelong Learning Trends* brings together statistics from the NCES and other sources, such as the Department of Labor, the U.S. Census Bureau and SRI International, to provide a comprehensive overview of the market for distance learning. This is the single best source of data on distance learning markets.

For projections of enrollment in California by public segment (i.e., CCC, CSU and UC), publications of the California Higher Education Policy Center are especially helpful. The Center’s publication *Tidal Wave II* (Breneman, Estrada and Hayward (1995)) reviewed projections prepared by the CCC, CSU, UC, the California Department of Finance, California Postsecondary Education Commission, the RAND Corporation and
and the National Center for Higher Education Management. Data concerning the development of distance education overseas is contained in publications of the OECD, especially in *Learning Beyond Schooling: New Forms of Supply and New Demands*.

Another useful source of data is the SCALE project at the University of Illinois at Urbana-Champaign. SCALE is the Sloan Center for Asynchronous Learning Environments, and has been developing a variety of projects since it was founded in March 1995. The center has a number of goals, including developing new courses on the Urbana campus, and to become a national leader in asynchronous learning networks (ALN). A variety of data about courses and evaluations are available from the center.

**VIII. ADDITIONAL CONSIDERATIONS**

There are two main considerations which have not been reviewed by in detail here. The first concerns the supply of distance learning. This lies outside the scope of the present review, but nonetheless is an important consideration. There is already a very crowded market, and significant competition among providers. The key to success in such a market is to identify the market niche in which one particular provider may be successful. This involves some information about demand, but also involves some data about the comparative advantage of the supplier, i.e., about the suppliers cost structure.

Another factor that has been mentioned, but not fully analyzed is the quality of distance education compared to the quality of traditional education. While perceptions of quality affect demand, little is known about the quality of distance programs compared to traditional ones. It is important to have a better picture of this area, but it is likely to take some time to develop appropriate studies.
IX. CONCLUSIONS

This study has reviewed the secondary literature on the demand for distance learning and the services of a virtual university. Several important studies were identified and reviewed. The main conclusion is that the market for distance learning and the services of a virtual university are likely to expand, for a number of reasons. The main reason will be the cost-effectiveness of the university. Real incomes have been rising only slowly, and scale economies and input substitution argue that distance learning should be a lower cost alternative to traditional classroom education.

While the study identified a number of factors that are important in determining demand for distance learning, no study accounted for all these factors in a systematic way. The Virtual Summer School of the CSU offered an opportunity to gather data which could address a number of the questions about demand. Careful consideration should be given to the idea of carrying out a study of demand based upon data gathered in a systematic fashion in a future offering of the Virtual Summer School.

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Clotfelter, Charles T. and Michael Rothschild (eds.), *Studies of Supply and Demand in Higher Education*, University of Chicago Press, 1993


Hanna, Donald E., “Washington State University Extended Degree Survey,” Extended University Services, Washington State University, March 5, 1992


National Center for Education Statistics, *Projections of Education Statistics*

National University Continuing Education Association, *The Knowledge Connection: The Role of Colleges and Universities in Workforce Development*, NUCEA, 1995


Appendix 1
CSU DIGITAL SUMMER SCHOOL

Campuses Offering Courses in Digital Summer School 1997
- Bakersfield
- Chico
- Dominguez Hills
- Fullerton
- Hayward
- Humboldt State
- Los Angeles
- Northridge
- San Bernadino
- San Diego State University
- San Jose State University
- CPSU, San Luis Obispo
- San Francisco State University
- CSU, San Marcos

Details About Course Offerings on Selected Campuses

<table>
<thead>
<tr>
<th>Campus</th>
<th>Courses/Credit Hrs**</th>
<th>Visit*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bakersfield</td>
<td>ENG 304 Technical and Report Writing (5 q.h.)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>ENG 305 Modes of Writing (5 q.h.)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>ENG LINGUISTICS 319 Structure of English (5 q.h.)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>ENV RES MGT 411 Environmental Law 1 (5 q.h.)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>INST 435 Negotiation and Conflict Mgmt. (5 q.h.)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>INST 477 Research on the Internet (2 q.h.)</td>
<td>No</td>
</tr>
<tr>
<td>Pomona</td>
<td>CIS 421 Multimedia Applications (4 q.h.)</td>
<td>?</td>
</tr>
<tr>
<td></td>
<td>ENG 201 Introduction to Modern Fiction (4 q.h.)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>FL 308 Contemporary France (4 q.h.)</td>
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</tr>
<tr>
<td></td>
<td>HST 202 United States History (4 q.h.)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>LS 401 Global Cities and Identity (4 q.h.)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>MHR 306 New Venture Creation (4 q.h.)</td>
<td>?</td>
</tr>
<tr>
<td></td>
<td>PHL 201 Introduction to Philosophy (4 q.h.)</td>
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<tr>
<td></td>
<td>PSY 201 General Psychology (4 q.h.)</td>
<td>Yes</td>
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<tr>
<td>Chico</td>
<td>Sociology 153 The Holocaust (3 s.h.)</td>
<td>No</td>
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<tr>
<td>SF State</td>
<td>COUN 333 From Classroom to Career (1 s.h.)</td>
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<tr>
<td>Fullerton</td>
<td>ECON 335 International Economics (3 s.h.)</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>KNES Physical Education Framework (TBA)</td>
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</tr>
</tbody>
</table>

*Visit to campus required?
** Credit Hours (q.h.=quarter hours, s.h.=semester hours)
APPENDIX 2

Web Sites

CSU Chancellor’s Office
www.calstate.edu/co/

Asynchronous Learning Network
www.aln.org

Alfred P. Sloan Foundation
www.sloan.org

University Continuing Education Association
www.NUCEA.edu

Western Governors’ University
www.westgov.org

California Higher Education Policy Center
www.policycenter.org

Sloan Center for Asynchronous Learning Environments (SCALE)
(University of Illinois at Urbana-Champaign)
www.scale.uiuc.edu