	Southern Regional	University of Phoenix	Western Governors University
Created by/year	SREB-states/1997	business/1990	14 Governors/1996
Number of states	16	national	18
Organization type	non-profit	for-profit	non-profit
Virtual degree granting?	no	yes	yes
Course & degree providers	existing institutions	self	existing
Level of degrees	AA/AS/B/M/D	Cert/AA/B/M	Cert/AA/AAS/B/M/D
Cert./AA/AS-AAS/B/M/D	0/1/6/6/7/0	0/1/0/6/6/0	1/1/1/0/0/0
Courses credit/noncredit	1000+/0	175+/64	193/1
Students now/projected	unknown	3,750/53% growth	10/10,000
Institutions now/future	100+	1	21/business
Community colleges/univ./both	both	NA	both
Public only, or public/private	public/private	NA	public/private/bus.
Operational/planning	operational	operational	operational
Projected/actual start date	Spring 1998	1990	September 1998
Cost to join	no	NA	$100,000/state+center
$ per student/course/program	0/$?/$?	NA	$30/$1-200/$500-1,000
Self-supporting?	yes/$?	yes	yes
Competency based?	no	no	yes
Technologies used	multiple	internet	multiple
Tuition differential	by state/institution	yes	yes
Web/print catalogs	yes/no	yes/yes	yes/no
Info collection/dissemination	yes	yes	yes
Comprehensive library services	no	yes, some	no
Multi-inst. online admissions app?	no	NA	yes
Online admissions	by institution	yes	yes
Electronic payment	no	yes	yes
Open entry-exit/alt. Calendar	some	some	some
Bookstore services	no	yes	yes
Corporate/business partners?	no	no	yes
Faculty/staff training	no	yes	no
Seek grants?	yes	yes	yes
$ Course/program development?	no	yes	yes
Copyright/int. prop. Policy?	no (by inst.)	yes	no (by inst.)
Advising/career counseling?	no (by inst.)	yes	yes (at centers)
Online student/financial aid	no	no	yes

Responding to the Vision of the Information Society: First Steps Towards a National Virtual University

A Policy Discussion Paper

Terence Karran and Juha Pohjonen

Oulun yliopiston avoimen yliopiston julkaisuja 4

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OULUN YLIOPISTO

Koulutus- ja tutkimuspalvelut

Avoin yliopisto

Oulun yliopistopaino

Oulu 2000

Comparative Features of Selected Virtual Colleges and Universities in USA

Feature	Florida Virtual	California Virtual	Colorado Electronic	Kentucky Campus
Created by/year	1999	Gov.-Legis./1997	CC system/1996	Gov-Legis./1997
Number of states	1	1	1	1
Organization type	SUS/SBCC Center	non-profit	CC system	higher ed. board
Virtual degree granting?	no	no	no	no/future ?
Course & degree providers	existing institutions	existing institutions	existing institutions	existing institutions
Level of degrees	Cert/AA/AAS/AS/B/M/D	Cert/AA/AS/B/M/D	Cert/AA/AAS	Cert/AA/AS/B/M/D
# Cert./AA/AS-AAS/B/M/D	TBD	33/10/9/14/33/6	0/1/1/0/0/0	0/0/0/0/0/0
# Courses credit/noncredit	1,900/?	1,600+/0	49/unknown	0/0
# Students now/projected	60,000+/66,000	50,000+/unknown	950/ 30%/yr	0/unknown
# Institutions now/future	38/+ privates	100+	12	27+privates
Community colleges/univ./both	both	both	community colleges	both
Public only, or public/private	public/privates future?	public/private	public	public/private
Operational/planning	planning	operational	operational	planning
Projected/actual start date	Fall 1999	1998	1996	1999
Cost to join	no	$3,500-11,000/inst.	no	no
$ per student/ course/program	0/0/0	0/0/0($ transaction?)	0/0/0	25% tuition?/0/0
Self-supporting?	state supported start	yes	no	no
Competency based?	no	no	no	yes
Technologies used	multiple	multiple	TV/Web	multiple
Tuition differential	by institution	by institution	no	unknown
Web/print catalogs	yes/no	yes/no	yes/yes	yes/yes
Info collection/dissemination	yes	yes	yes	yes
Comprehensive library services	yes/DLLI	yes	yes	yes
Multi-inst. online admissions app?	yes/FACTS	no	NA	yes
Online admissions	by institution	by institution	yes	yes
Electronic payment	yes	no	no	yes
Open entry-exit/alt. calendar	some	some	some	some
Bookstore services	some	yes	no	yes
Corporate/business partners?	yes	yes	no	yes
Faculty/staff training	yes/limited	yes	yes	yes
Seek grants?	as appropriate	yes	yes	yes
$ course/program development?	by institution	yes	yes	yes
Copyright/int. prop. Policy?	by institution/system	no (by inst.)	yes	no (by inst.)
Advising/career counseling?	yes/FACTS	no (by inst.)	no (by inst.)	yes (by central staff)
Online student/financial aid	yes/FACTS	yes	yes	yes

University of Phoenix

Fully accredited

For profit institution

One of the five largest graduate universities in the country (includes on-site and distance learning enrollments)

Has a seven-year old online service designed for working adults

There are 1,700 students enrolled in online service

Student services by telephone, e-mail, fax-mail, internet web

Grants no tenure, employs 45 full-time faculty and 4500 adjunct faculty (for on-campus and distance learning combined)

Degrees offered by distance learning are:

Bachelors of Science in Business/Administration; Business/Information Systems; Business/Management; Business/Accounting

Masters of Business Administration; Business Administration/Technology Management; Business Administration/Global Management

Master of Arts in Organizational Management

Master of Arts in Education

Master of Nursing

Tuition is $295/credit undergraduate and $325/credit graduate

Has a campus in Orlando

Web site: http://www.uophx.edu/

Where there is no vision, the people perish

(Old Testament, Book of Proverbs, Chapter 29, Verse 18)

Acknowledgements

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JEC College Connection (formerly Mind Extension University)

Is a creation of Jones Education Company (JEC), owned by Jones Intercable, one of the largest cable television companies in the U.S.

Distributes programs from about 20 colleges and universities (tuition varies by institution)

Glenn Jones, CEO Jones Intercable has also founded International University that is distributed by JEC (tuition:$200/credit undergraduate and $234/credit graduate)

Has created an online network

Programs are delivered via satellite to 90 million homes

Most programs are taped, a few are live

Anecdotal information indicates that enrollments have been small historically

Degrees are granted by participating institutions (MEU is not accredited)

Student services are provided by Jones via toll free telephone number

Web site: http://www.meu.edu/cc/index.html

Colorado Electronic Community College

Was created in 1995 by the Colorado Community College and Occupational Educational System

Its purpose is to offer associate degrees through distance learning technology

Students interact with faculty over the Internet and through voice mail boxes

They are building a video and multimedia production and training facility

First classes were offered in Fall 1995

Currently offering fifteen courses per semester

They offer portfolio assessment and award transfer credit

Web site: http://www.cccoes.edu/cccoes/cecc/main.htm

California Virtual University

Will use all mediums and all delivery methods

Will be mostly independent of time and place

First phase: professional degrees and continuing education

Second phase: associate and baccalaureate in general and liberal arts

Involves all higher education in California: the California State System, the University of California System, the California Community College System (all public institutions), Cal Tech, USC and Stanford (private institutions).

It will be open to any California public or private institutions accredited by the Western Association of Schools and Colleges.

Plan to market education globally under the “California” brand name

All courses will be developed by participating colleges and universities

They plan to open the doors of the California Virtual University in October of 1997 with limited offerings (this aggressive roll-out is possible because the public institutions are already offering many courses - for example, the California State System is offering 50 on-line courses for the summer 1997 session)

Tuition costs will be set by each campus, and the market will decide whether the cost is reasonable

State will fund on the same FTE basis as on campus courses

Will not be accredited

Will use a mix of technologies

Three of the issues driving development:

1. Economic development will be fostered

2. Exporting to a global market (public relations and profit)

3. Expanding access in California, dealing with influx of new students, both traditional age and adult learners

Web site: http://www.vudesign.ca.gov/

Contents

Summary Description of the Main Competitors

Western Governors University

The Western Governor's University is a new, public institution

Created by governors June 24, 1996

Addresses concerns about projected increases in student numbers and rising educational cost

Fourteen states and a territory are currently members

It is separately incorporated as a non-profit corporation

Designed to be self-supporting

A tuition split (conjecture has it as a 50%/50%), plus outside funding will fund it

Will be degree-granting and accredited

It will draw on the curriculum and faculty resources of numerous institutions: colleges and universities, private businesses, government, and individuals.

Essential student services will be provided through electronic and other non-traditional means

Learning centers in each state will offer support to students

Will not focus on the number of credits a student has accumulated but rather it will certify the competencies or learning outcomes that the student can document or demonstrate

A student may demonstrate competency in a variety of ways: self-instruction, courses (credit non-credit), military training, apprenticeships or other means

Scheduled to begin offering courses and programs in August, 1997

Will use a mix of all technologies

Web Site: http://www.westgov.org/smart/vu/vu.html

Western Governors University
Website:http://www.wgu.edu
Sponsors: Apple, AT&T, Cisco Systems, Drake Internationa, IBM, ITP, KPMG, Microsoft, Novell, Sloan, Sun Nicrosystem, Sylvan Prometric, 3COM
Universities and Colleges involved

Includes Universities in: Alaska Arizona California Colorado Guam Hawaii Idaho Illinois Montana Nebraska New Mexico North Dakota Oklahoma Oregon Utah Virginia Washington Wyoming

University of Alaska System
Northern Arizona University
Rio Salado College
Colorado Electronic Community College
Regis University
University of Colorado - Boulder
University of Colorado - Denver
University of Guam
University of Hawaii
Idaho Center for Higher Education
Idaho State University
University of Idaho
Fundwell.com
Montana State University
Chadron State College
University of Nebraska - Lincoln
Community College of Southern Nevada
Eastern New Mexico University
North Dakota State College of Science
Oklahoma State University
Eastern Oregon University
Marylhurst University
Dallas County Community College
ITP/Course Technology
Texas Tech University
Brigham Young University
Utah State University
Old Dominion University
Washington City University
Washington State University
University of Wyoming

Executive Summary

1. There is confusion, both in academic circles and the public more generally, about the definition of a virtual university. Hence in considering such an option, it is worth looking more fundamentally at the contexts for higher education, and the functions of a National Virtual University equipped to meet the needs of the 21st Century.
2. The increase in the use of ICT has caused a radical increase in demand for higher education globally, and increased access to higher education via the use of ICT. New suppliers in the form of private and corporate universities, now compete with universities in their home countries, and increasingly, overseas.
3. Although demands for higher education are growing rapidly, analysis of the new and changing demands on universities at local, national and international levels, within an increasingly global knowledge market, indicates that the role of a National Virtual University will be much broader than that of an existing university. Moreover, a NVU will need to successfully compete in an environment which is growing in competitiveness and complexity as corporate universities start to operate, but will have to do so with greater efficiency and lower funding.
4. The socio-economic environment in Finland is characterised by an internationally high (and growing) involvement with information and communication technologies in all spheres of life. Within this fast developing Information Society, there is a high need for increasing skills levels and re-training, especially with respect to ICT. However, like elsewhere in Europe, the use of technology for collaborative teaching in Universities and for promoting joint research with industry, is comparatively underexploited, although the existing higher education platform, provides a useful structure which could adapt to, and benefit from, the establishment of a National Virtual University.
5. The rationale for incorporating the use of new technologies in higher education by building a National Virtual University is well-established. Such a development would require a quantum leap in the design and development of a new learning method. However, in addition to educational benefits, the NVU would aid the creation of a knowledge based economy, the promotion of social cohesion, the protection of the existing Finnish university system, and the preservation of national language and culture.

6. The experience of previous virtual university ventures in the USA demonstrates that collaborative ventures, based on existing providers and reliant on re-engineering of existing teaching and learning practices, are unlikely to be successful, even where they are well financed. A National Virtual University can be constructed with varying degrees of functionality, but where it covers all ranges of university activities (teaching, research and technology transfer), and is well-linked to the local community, the cost of development will be high but the returns on expenditure will be greatest.
7. A project of this size, complexity, cost and importance will only succeed in maximising its potential as a collaborative venture, if it involves all stakeholder groups in discussing its form, as consensus on the form of the NVU will be critical in ensuring the success of its implementation.

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and Humberside
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Juha Pohjonen, M.A, eMBA

Campus Futurus
Faculty of Education
University of Oulu
juha.pohjonen@oulu.fi

University of Maryland University College
Wor-Wic Community College
Alcorn State University
Delta State University
Mississippi State University
Mississippi University for Women
University of Mississippi
University of Southern Mississippi
Beaufort County Community College
Caldwell Community College & Technical Institute
Carteret Community College
Catawba Valley Community College
Central Piedmont Community College
Cleveland Community College
College of the Albemarle
Craven Community College
Durham Technical Community College
East Carolina University
Edgecombe Community College
Elizabeth City State University
Fayetteville Technical Community College
Forsyth Technical Community College
Gaston College
Guilford Technical Community College
Halifax Community College
Isothermal Community College
Johnston Community College
Lenoir Community College
Mayland Community College
Montgomery Community College
North Carolina State University
Pitt Community College
Randolph Community College
Rowan-Cabarrus Community College
Stanly Community College
University of North Carolina at Chapel Hill
University of North Carolina at Wilmington
Vance-Granville Community College
Wake Technical Community College
Western Carolina University
Western Piedmont Community College
Wilkes Community College

University on line
Website:http://wwwuol.com
Sponsors: Not Known
Universities and Colleges involved

Clemson University
Eastern Michigan University
George Mason University
Georgetown University
Northeastern University
Park College
Regent University
The University of Texas System
University of Toledo
Wichita State University

University of Arkansas
University of Arkansas at Little Rock
Delaware State University
Delaware Technical & Community College
University of Delaware
Brevard Community College
Central Florida Community College
Florida Agricultural & Mechanical University
Florida Atlantic University
Florida Community College
Florida Gulf Coast University
Florida International University
Florida State University
Gulf Coast Community College
Indian River Community College
North Florida Community College
Palm Beach Community College
Santa Fe Community College
Seminole Community College
St. Johns River Community College
St. Petersburg Junior College
Tallahassee Community College
University of Central Florida
University of Florida
University of North Florida
University of South Florida
University of West Florida
Valencia Community College
Armstrong Atlantic State University
Athens Area Technical Institute
Clayton College & State University
Columbus State University
Darton College
East Georgia College
Gainesville College
Georgia College & State University
Georgia Institute of Technology
Georgia Perimeter College
Georgia Southern University
Georgia Southwestern State University
Southern Polytechnic State University
State University of West Georgia
University of Georgia
Valdosta State University
Eastern Kentucky University
Lexington Community College
Morehead State University
Murray State University
Paducah Community College
University of Kentucky
University of Louisville
Western Kentucky University
Bossier Parish Community College
Grambling State University
Louisiana Tech University
Northeast Louisiana University
Northwestern State University of Louisiana
Southeastern Louisiana University
Charles County Community College
Community College of Baltimore, Catonsville
Community College of Baltimore, Essex
Essex Community College
Frostburg State University
University of Baltimore

1. Introduction and Rationale

The *National Strategy for Education, Training and Research in the Information Society for 2000-2004*, issued in 1999 by the Finnish Ministry of Education has the following vision:

> "By the year 2004 Finland will be one of the leading interactive knowledge societies. Success will be based on citizens' equal opportunities to study and develop their own intellectual capacity and extensively utilise information resources and educational services. A high-quality, ethically and economically sustainable mode of operation in network-based teaching and research will have been established"[1]

As the *Higher Education Policy in Finland* paper (published the previous year) makes clear, the university sector is a major driver with a central responsibility for helping to deliver this vision, viz.: "Education and research are crucial to Finland's strategy for the future, which aims at the well-being of its citizens, cultural diversity, sustainable development and prosperity."[2] The same document highlights the ***nationwide virtual open university*** project (www.avoinyliopisto.fi) which it defines as "a system of open university teaching and associated services offered through electronic technology" and describes it as "a channel to a new type of co-operation between universities and to a competitive situation which benefits all parties. … The virtual open university does not seek to take the place of existing teaching systems, but forms an integral component of the overall provision of university education. … (and) … The virtual open university is also a step towards a new learning society."[3] However the more recent policy document, after indicating that "Virtual university education is based on the principles of open and distance learning" specifies as a policy objective that "A multidisciplinary virtual university will be established to produce and transmit high-quality educational services and network-oriented research. The network will include the services offered by the virtual open university."[4]

Research already undertaken[5] demonstrates that most virtual university projects elsewhere in Europe differ from the Finnish project, in being developed at individual university level, rather than through a collaborative national project. The decision for a nationwide approach to the use of new technologies in higher education, rather than allowing individual universities to produce similar parallel and competing projects, is laudable and fiscally prudent, as it:

- reduces wasteful duplication, enables economies of scale, concentrates resources to produce critical mass, and thereby maximises the return on scarce public finances, at a time when government taxation and spending levels are politically sensitive.
- ensures that all universities can (and will) become involved, which increases the connectivity of the resultant network, enabling the possibility of benchmarking best practice between the partners and further raising the individual and composite value of the project to them.

- addresses and reinforces other national objectives, such as cost effectiveness and equality of opportunity by recognising that "Because of the long distances and small population, educational establishments in Finland are relatively small and scattered far from each other. This increases the cost of education … It is time to incorporate the numerous virtual study projects of individual universities and researcher networks into a nationwide network to strengthen networking in research."[6]
- enables collaboration between:
  - same subject departments across the h.e. sector;
  - different subject departments within individual institutions and across the h.e. sector;
  - the higher education and business sectors, in the areas of both research and training.
- places overall project administration at Ministerial level (rather than with a single university), both emphasising the national significance of the project, and enabling a quasi-commercial approach to project management, quality monitoring, and formative and summative evaluation, which together should improve the chances of success for the project.

The project is also a clear demonstration of national self-confidence, strategic foresight and political commitment, both within Finland, and externally to the rest of Europe. However, from the descriptions provided in the policy documents presented above, it is difficult to decide whether the ***multidisciplinary virtual university*** is the same as, or different from, the ***virtual open university,*** more especially as the latter will be included in the former, while both are to be based on the principle of open learning.

However, such a lack of clarity is not unusual when describing new virtual organisations. For example, the recent UNESCO World Conference on *Higher Education in the 21st Century* reported that "The large number of different terms and expressions used in the context of distance or virtual education warrants semantic examination so that they can be classified, misunderstandings can be avoided and the major past and future trends highlighted."[7] Similarly, Glenn Farrell's study of the development of virtual education (based on 10 regional reports) admitted that "The label virtual is widely and indiscriminately used around the globe. Indeed it is frequently used interchangeably with other labels such as open and distance learning, distributed learning, networked learning, Web-based learning, and computer learning," but found that "in spite of the increased use of the term virtual, there are very few examples of institutions using information and communications technologies to carry out all the functions."[8]

In addition, university staff have a personal and vested interest in determining how universities will develop in the future. The nature of the work undertaken by

Hudson Valley Community College
Schenectady County
Community College
Ulster County Community College
Mohawk Valley
Community College
University Colleges of Technology - Alfred,Canton, Cobleskill, Delhi, Morrisville
SUNY Office of Advanced Learning & Information Services
Monroe Community College
SUNY Utica Rome
SUNY Center for Learning and Technology
Tompkins Cortland Community College
SUNY Oneonta
Alfred P. Sloan Foundation
Westchester Community College
University at Stony Brook
Cayuga Community College

Name:Pennsylvania Virtual University
Website:http://business.ship.edu/vu/
Sponsors: None
Universities and Colleges involved
Millersville University,
Shippensburg University,
West Chester University

Name: Southern Regional Electronic Campus
Website: http://www.srec.sreb.org/
Sponsors: None
Universities and Colleges involved
Cover universities and colleges in Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, and North Carolina

Alabama Agricultural and Mechanical University
Auburn University
Bevill State Community College
Calhoun Community College
Central Alabama Community College
Gadsden State Community College
George Corley Wallace State Community College
Jacksonville State University
Jefferson State Community College
Lawson State Community College
Samford University
Troy State University
Troy State University Montgomery
U.S. Sports Academy
University of Alabama
University of North Alabama
Arkansas Technical University
Southern Arkansas University Tech.

Massachusetts: Distance Learning Honors Courses
Website: http://www.umass.edu/pubaffs/dislearn/fac_part.html
Sponsors: None
Universities and Colleges involved

Berkshire Community College,Bridgewater State College, Holyoke Community College, UMass Boston, UMass Amherst, UMass Lowell	Environmental Issues in Massachusetts
Cape Cod Community College, Holyoke Community College, Massasoit Community College, Quinsigamond Community College, UMass Amherst, UMass Dartmouth, Middlesex Community College,	Poets in Massachusetts
Bristol Community College, Mt. Wachusetts Community College, Fitchburg State College, Worcester State College, UMass Lowell, Bristol Community College,	Ethnicity in Massachusetts
Middlesex Community College, Massachusetts Bay Community College, Westfield State College, Framingham State College, UMass Amherst,	Business and Economic Issues in Massachusetts

New York State University
Website: http://sln1.suny.edu/sln
Sponsors: Alfred P. Sloan Foundation
Universities and Colleges involved

State University of New York
University at Buffalo
Binghamton University
SUNY Old Westbury
SUNY Empire State College
University at Albany
New York State College of Ceramics
SUNY Plattsburgh
SUNY New Paltz
SUNY Purchase
SUNY Cortland
Finger Lakes Community College
Columbia-Greene Community College
SUNY Oswego
SUNY Farmingdale
Genesee Community College
Dutchess County Community College
SUNY Environmental Sciences & Forestry
Fashion Institute of Technology
Niagara County Community College
Orange County Community College
Broome County Community College
SUNY Fredonia
Rockland County Community College
Herkimer County Community College
Jamestown Community College
Sullivan County Community College

academics revolves around identification, measurement, categorisation and analysis of physical and social phenomena, and their interest is more especially stimulated when the entity under consideration is the university itself, not least because they have a vested interest in affecting the speed and direction in which it may evolve – as the US President F.D Roosevelt observed, “it is easier to move a cemetery than change a university curriculum.”

Consequently, when considering the construction of a national virtual university, there are valid reasons not to adopt a approach which has as it’s starting point an attempt at definition, namely:

Invalidity of models in the face of technological change - the technology inherent in current models of virtual organisations is developing at an acceleratory pace, which quickly can make such models invalid. Current thinking about virtual universities centres around the World Wide Web as the delivery tool, with the desk-top personal computer as the recipient, and Microsoft products as the display and communication platform. Hence the growth of p.c. usage and the attempt to physically “wire-up” the nation state are seen as important building blocks for creating virtual universities. However, R and D projects such as Bluetooth (in which Nokia has a major role) and the development of WAP (Wireless Application Protocol) will mean that new mobile devices (rather than PCs) will be able to gain access to the internet through a “microbrowser” displaying web pages which are specially formatted for tiny screens, and the cables that currently tie PCs together will be replaced by short-wave radio links. Similarly, interactive t.v. will remove the need for a personal computer to gain access to the internet and the world wide web.

The constraint of definitions - creative thinking about new educational organisations may be constrained rather than improved by focusing on existing definitions of virtual universities, especially when the definitions are very loose. The organisation which meets the needs for new learning environments in Finland might not properly be described as a “university” - virtual or otherwise.

The construction of a radically different organisation is being considered because the arrival of the knowledge based economy and the information society have totally altered the expected roles and responsibilities of conventional universities. Irrespective as to the final title of the proposed project (“Virtual C@mpus”, “On-line university”, etc.), it will both require considerable resources and have significant long term importance for the role of higher education in Finland, and its impact on the economy and society more widely. Moreover, the rapid pace of technological development means that if the project fails, it will become increasingly more expensive to catch up with competitor economies.

Hence:

- the changes in the role and functions of universities, caused by the needs and demands of the fast emerging knowledge society;

- the large commitment in fiscal and manpower resources, required by the project, and the high political and economic cost of failure;
- the centrality of the exercise to future national success, within the knowledge based economy;
- the fact that it is a flagship project (and thus a demonstration of national resolve and competence);

make it sensible to adopt a functional approach, and consider in greater depth the more fundamental nature of university operations.

Moreover, such discussion:

- ensures wide dissemination of the project's ideas;
- enables the concerted knowledge of those involved to be focussed on the project;
- facilitates a consensual approach to the projects goals and objectives, which makes project implementation easier to achieve.

Summary

This discussion paper does not try to provide a fully finished policy framework, but instead hopes to stimulate debate on this important project, which will help determine Finland's standing within both the European higher education arena and, more crucially, the emerging global knowledge economy. Within such an approach, the following question provides a useful starting point:

How should the Finnish national virtual university (NVU) be configured and constructed (in terms of aims and objectives, structure and functions, management and operation, teaching and learning environments, products and services), to develop the skills/ability, knowledge/expertise, capacity/size of the higher education sector, so that it can:

- *exploit areas of national strength and competitive advantage;*
- *address the social and economic challenges of the information society, and thereby*
- *maximise national prosperity and individual fulfilment?*

The following questions arise from this:

- *What are the International/European/National/Regional contexts for higher education?*
- *What are/should be the functions of a 21st century university, to address the needs of these contexts?*
- *How could a Finnish NVU best undertake these functions, either in conjunction with other universities, or by itself?*

Jones Education
Website: http://www.jec.edu/
Sponsors: Netscape, E-Intershop
Universities and Colleges involved

Jones International University	Masters Business Communication
George Washington University	Masters Education Technology Leadership
University of Colorado Health Science Center	Masters Nursing (MSN)
University of Colorado at Colorado Springs	Masters Business Administration (MBA)
Regis University	Bachelor's Business Administration
Jones International University	Bachelor's Business Communication
California State University, Dominguez Hills	Bachelor's Nursing
Colorado Electronic Community College	Associate Degree: Associate of Arts
Seattle Central Community College	Associate Degree: Associate of Arts
Jones International University	Certificate Program Oral and Written Communication Skills
Jones International University	Certificate Program Communication Technologies
Jones International University	Certificate Program Business Communication Skills
Jones International University	Certificate Program Communication Management
Jones International University	Certificate Program Business Technologies
Jones International University	Certificate Program Advanced Oral and Written Communication Skills
Jones International University	Certificate Program Organizational Communication
Jones International University	Certificate Program Early Reading Instruction

Connecticut State University System
Website: http://www.csu.ctstateu.edu/onlinecsu/
Sponsor: Real Education
Universities and Colleges involved

CSU's four universities are located throughout Connecticut: Central in New Britain, Eastern in Willimantic, Southern in New Haven, and Western in Danbury

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Florida's Campus
Website: http://www.flcampus.org
Sponsor:None
Universities and Colleges involved

10 state universities and 28 community colleges

Indiana College Network
Website: http://www.icn.org
Sponsor: None

Universities and Colleges involved	Ivy Tech State College
Independent Colleges of Indiana	Purdue University
Indiana State University	University of Southern Indiana
Indiana University	Vincennes University

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2 Environmental Analysis

International Context

The 1998 UNESCO World Conference in Paris on *Higher Education in the 21st Century*, marked the culmination of a three year study with preparatory conferences across the globe. The scale and comprehensiveness of this exercise indicates the importance which UNESCO attaches to higher education in the 21st century, and the need to "lay down the fundamental principles for the in-depth reform of higher education systems throughout the world … (to) … promote the transformation of higher education, in its material and virtual manifestations, into an environment for lifelong learning, for cultural debate, for the affirmation and safeguarding of diversities."[9] The UNESCO conference concluded that "The problems of higher education … are one of the great challenges confronting society in the approach to the 21st century. Higher education, for its part, is faced with the challenge of preparing itself to fulfil its mission adequately in a world in transformation and to meet the needs and requirements of 21st century society, which will be a society of knowledge, information and education."[10]

The major factor identified by the UNESCO Conference was the growth in information and communication technologies (ICT). The frequency with which ICT is mentioned, in both popular press and informed debate, has caused complacency about the assumed benefits (or threats) that it constitutes. Hence accurate data is useful to inform the debate, and give a true estimate of the future challenges ICT will create. Twenty years ago, only 50,000 computers existed, while today, that many units are sold every 10 hours around the world. Internet expansion has been even greater - in 1985 there were about 300,000 email users registered worldwide, yet only a decade later the United States alone, accounted for over 80 million users.[11] Accurate figures in such a dynamic rate of growth are problematic, but current 'guesstimates' suggest that the Internet has a user population of between 120-150 million. It took radio 37 years to build an audience of 50 million and television about 15 years to reach the same number of viewers - but it took the World Wide Web just over three years to reach its first 50 million users.[12]

This growth in access has stimulated, and been stimulated by, a growth in provision. There were 100,000 internet host sites in 1989, one million by 1992, close to 10 million by 1995 and, according to *The Internet Society* forecasts, this number is projected to grow to 20 million by the end of 2000.[13] This level of connectivity and information sharing will rise even more steeply as such technologies become further integrated. It is already possible to send and receive email via a mobile phone, and as the technologies of personal computing and digital television (both satellite and terrestrial) merge, these different aspects of information exchange will form a seamless system.

The information age and the knowledge-based economy have altered the demand and supply of higher education. Demand has been characterised by three features:

Increased Level of Demand - knowledge based economies require increasing levels of education and training, which has increased demand for higher education. As Dias [14] reports "between 1970 and 1988, the number of students was multiplied by eight in sub-Saharan Africa, by six in Oriental Asia and in Pacific as in Arab States, by four and half in Latin America and Caribbean, by two in South Asia." Even in the more mature Western European economies, growth in h.e. has been rapid. In Austria, for example, university enrolment increased by 260% between 1970 and 1991. In Portugal the number of students in higher education increased from 80,000 in 1980-81 to 290,000 in 1995/96, while in Finland the goal is for an age participation rate of 60-65% by 2000. The global growth in higher education has been phenomenal over the last few decades. In 1960 world higher education enrolment was only 13 million; in 1970 it was already 28 million; in 1980 the total stood at 51 million, and by 1995 there were 82 million higher education students worldwide.[15] A recent Australian study of future demand for higher education forecast that global demand for higher education places would increase to an estimated 97 million in 2010 and 159 million in 2035.[16] Hence there is every reason to predict that the current trend will continue and the world enrolment total will climb beyond the current unprecedented total.

New types of courses demanded - as knowledge becomes dynamic, and information proliferates in scope and accessibility, an ever-increasing number and proportion of jobs require knowledge and skills of a high order. Technological advance disrupts employment structures, creates personnel needs in new fields and specialisms, alters the qualifications and skills required in new and existing fields, while making other competences redundant. In the new global knowledge economy, sources of advantage such as locality or nearness to market no longer exist. It is the knowledge of a firm's people and the effective management of that knowledge which will be critical to its success. The determinant link between the knowledge base of a company's workforce and its competitiveness was identified at the start of the decade by Professor Lester Thurow (Dean of MIT's Sloan School of Management) who rightly argued that "The education and skills of the workforce will be the key competitive weapon in the twenty-first century. The reason: there is a whole set of technologies coming along that will demand that the average workers … have skills that have not been required in the past. These skills go beyond the narrow duties of doing one's job, to a broad skill set to adapt to new technologies and change in the workplace."[17]

These changes have led companies to demand new skills from graduates, as the U.K.´s Association of Graduate Recruiters notes "The most significant challenge for graduates will be to manage their relationship with work and learning. This requires skills such as negotiating, action-planning and networking, added to qualities like self-awareness and confidence."[18] This shift has been characterised

Common Market of Courses and Institutes
Website: http://www.cic.uiuc.edu/CMCI/cmci_homepage.htm
Sponsors: None
University/College Participants

University of Chicago	University of Minnesota
University of Illinois-Chicago	Northwestern University
University of Illinois-Urbana	Ohio State University
Indiana University	Pennsylvania State University
University of Iowa	Purdue University
University of Michigan	University of Wisconsin-Madison

Community College Distance Learning Network
Website: http://ccdln.rio.maricopa.edu/
Sponsors: None
Community Colleges and Types of Courses

Cuyahoga Community College (Ohio)	General Studies, English, Business, Computer Science
Dallas Community Colleges (Texas)	AA/Transfer, Communications, Social Sciences, Business/Computer, Science/ Math,Humanities
Foothill/DeAnzaColleges(California)	AA/Transfer, General Education, Business/Computer, Language/Creative, Arts, Social Sciences, Career Training
Kern Community College District (California)	AA/Transfer, Career Training, Math/ Science, Professional Develop., Bus/ Computer Studies
Kirkwood Community, College (Iowa),	English/Humanities, Continuing Education , Social Sciences, Business, Math
Miami-Dade, Community College, Virtual College, (Florida)	AA/Transfer, General Education, Business/Education, Career Training, Allied Health, Study Skills/ESOL
Rio Salado College, (Arizona)	General Education, Computer Usage, Business/Management, Career Training
Sinclair Community, College (Ohio)	AA/Transfer, General Studies, Business/ Computer, Engineering Tech, Allied Health

Cuyamaca College
DeAnza College
Diablo Valley College
El Camino College
Evergreen Valley College
Foothill College
Fullerton College
Glendale Community College
Golden West College
Grossmont College
Irvine Valley College
Lake Tahoe Community College
Las Positas College
Long Beach City College
Los Angeles Harbor College
Los Angeles Mission College
Los Angeles Trade-Tech College
Merced College
Mira Costa College
Mission College
Modesto Junior College
Mt. San Antonio College
Ohlone College
Oxnard College
Palomar College
Rio Hondo College
Riverside Community College
Sacramento City College
San Bernardino Valley College
San Diego Mesa College
San Joaquin Delta College
Santa Barbara City College
Santa Monica College
Santa Rosa Junior College
Santiago Canyon College
Shasta College
Solano Community College
Southwestern College
Taft College
Victor Valley College
West Hills College
West Valley College
Yuba College
California Institute of Integral Studies
California School of Professional Psychology
Chapman University
Fielding Institute
Golden Gate University
Hope International University
John F. Kennedy University
Loma Linda University
National University
New College of California
Pacific Oaks College
Pepperdine University
Phillips Graduate Institute
Saybrook Graduate Institute
Stanford University
University of La Verne
Western University of Health Sciences

by Botkin[19] as a shift from maintenance learning (i.e. acquiring an historical body of knowledge required to deal with known recurring events and problems) to dynamic learning (which enables change, restructuring and problem reformulation) – from 'just in case' knowledge to 'just in time' knowledge. This analysis concurs with an OECD study on *The Knowledge-Based Economy*, which shows how computers have codified factual knowledge and made it less necessary for people to possess, with the result that "as access to information becomes easier and less expensive, the skills and competencies relating to the selection and efficient use of information becomes more crucial. Tacit knowledge in the form of skills needed to handle codified knowledge is more important than ever in labour markets. Codified knowledge might be considered as the material to be transformed, and tacit knowledge, particularly know-how, as the tool for handling this material."[20] Hence, increasingly in the future, "the key skill, which will distinguish between individuals within knowledge communities, will be the skill which enables the individual to sift and select the right kind of information from the relevant sources, and make the necessary connections at the right time."[21] As Evans and Nation cogently argue "The increasing sophistication and specialisation of contemporary society, … is producing changes to the ways in which education is used, developed and presented. Lifelong learning, professional development and workplace training have existed for many decades. However, these formerly minor aspects of education are now expanding so rapidly that they constitute an equal or greater proportion of the profiles of many universities and colleges."[22] To cope with this dynamic working environment, students expect universities to equip them with life-long learning skills and provide them with continual high level skills upgrading during their careers.

Personalisation of provision - wider experience of higher education within the population causes students to adopt consumerist attitudes, and an expectation that education should be flexible enough to meet their own career and training needs. Part time students who study while working, are starting to use the regime of business efficiency in which they operate, and the level of customer care they themselves provide, as the benchmarks against which to measure their experience of higher education. Students will expect high cost efficiency and effectiveness from higher education providers, more particularly when they have to pay tuition fees themselves. This demand for flexibility extends beyond the curricula offered by universities, to include entry and exit points, access and accreditation of prior learning, study periods, and modes of delivery. Additionally, diagnostic tools enabling the identification of students preferred learning styles will precipitate a demand for learning materials tailored and related to individual styles, thereby enabling students to maximise the learning they obtain from materials. In the future universities will use "electronic means of communication to provide individualised educational systems capable of giving rapid feedback to persons who are part of a dispersed, heterogeneous student population."[23]

In terms of supply, four features are noteworthy.

Growth of Profit Making Universities **-** a new type of corporate university enterprise is exploiting the growing market for career training and degree programs. In just 20 years, the University of Phoenix has become the largest private American university, delivering business and applied degree programs to over 60,000 students in more than 70 locations in the United States. A recent British study highlighted the "explosion of activity in corporate education, for-profit higher education, on-line delivery and university partnerships in the last five years … (and argued that) … The drivers behind borderless education are strong and can only grow."[24]

Involvement of Business **-** the growing market for higher education and life long learning has attracted the attention of the corporate sector as a producer, rather than consumer, of graduates. The accelerating progress of communications and information technologies has produced a post-industrial knowledge based economy, in which universities are crucially involved in the production and transfer of the central commodity - knowledge itself. As knowledge based private sector industries (computing, pharmaceuticals, electronics, etc.) grow to dominate the economy, they are converging with the conventional established suppliers of knowledge. Consequently, universities have become more entrepreneurial and developed closer industrial links, through (inter alia) science parks specialising in technology transfer from university departments. For example, the Technopolis at Oulu in Finland is owned and run by a consortium which includes the University of Oulu, with the University Rector, Professor Lauri H.J. Lajunen, in the position of Vice Chairman of the Board of Directors.

Simultaneously private sector firms in the knowledge based industries have started to move into the area traditionally occupied by higher education, and set up as providers of education and training, initially on an in-company basis, but with the longer term aim of selling expertise to external customers. This recognition of education as a "product" has lead non-educational corporations to extend their in-house training provision and offer their educational services to the wider public. Already business organisations are setting up "quasi universities", such as the Ford Corporate University, and British Aerospace Virtual University. For example, Arthur Andersen, a global accounting and consulting firm, purchased a former college campus, spent $140 million to renovate it and now expends about 6.5% of its gross revenue for educating its employees.[25] The number of corporate universities has grown from 400 in 1988 to over 1000 in 1998, with over 40% of US *Fortune 500* firms now claiming corporate university status. Although the main interest of these new corporate universities is non-accredited training, almost 40% are interested in granting an accredited degree, usually via a partnership with a higher education institution.[26]

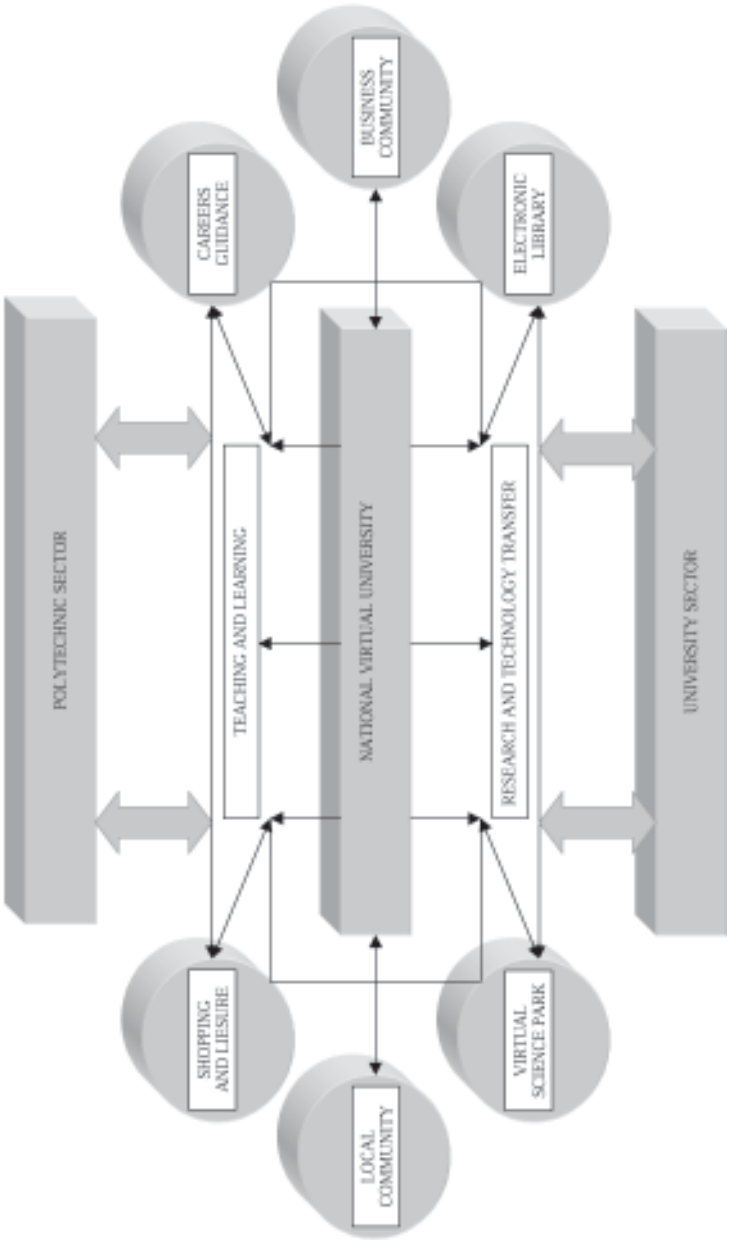
Use of New Technologies for Teaching **-** more institutions (traditional universities, open universities, in-company universities and corporate universities) are using

Appendix 2
Summary of Current Suppliers of Academic "gateway" sites in the USA

California Virtual University
Website: http://www.california.edu
Sponsors: Cisco Systems, International Thomson Publishing, Oracle Corporation, Pacific Bell, Alfred P. Sloan Foundation, Sun Microsystems, Inc.
Universities and Colleges involved

UC Berkeley
UC Davis
UC Irvine
UCLA
UC Riverside
UC Santa Barbara
UC Santa Cruz
Cal Poly Pomona
Cal Poly San Luis Obispo
CSU Bakersfield
CSU Chico
CSU Dominguez Hills
CSU Fresno
CSU Fullerton
CSU Hayward
CSU Long Beach
CSU Los Angeles
CSU Northridge
CSU Sacramento
CSU San Bernardino
CSU San Marcos
CSU Stanislaus
Humboldt State University
San Diego State University
San Francisco State University
San Jose State University
Allan Hancock College
American River College
Antelope Valley College
Bakersfield College
Barstow College
Butte College
Cabrillo College
Cerro Coso Community College
Cerritos College
Chabot College
Citrus College
City College of San Francisco
Coastline Community College
College of Marin
College of San Mateo
College of the Canyons
College of the Desert
College of the Redwoods
College of the Sequoias
College of the Siskiyous
Compton College
Cosumnes River College
Crafton Hills College
Cuesta College

Appendix 1



new technologies for both on-campus students and distance learners. This is in response to demand and expectation, as incoming students are already steeped in the information society, and tomorrow's students will be even better acquainted with new technology.

Hence students will increasingly expect to learn with computers and the latest technology, not least because it is integral to their personal background and experience, and because an increasingly competitive labour market demands ITC skills. In the United States Gubernick and Ebeling,[27] report that there are already 93 'cyberschools', 55% of the 2,215 four year colleges and universities in the USA have courses available off-site and 1 in 7 of US college students are connected to the virtual college classroom. Similarly, Sadlak's recent appraisal of the globalisation of higher education noted that "over 1 million students are now plugged in to the virtual classroom. Estimates indicate that 'cyberstudents' will more than triple in number by the turn of the century."[28] These American developments are now mainstream rather than peripheral, with some of the best known traditional universities offering distance degree programs, including Stanford, the University of Colorado and Harvard, where the Harvard Extension School currently sponsors 580 courses and enrolls 13,500 students annually.[29] A major consequence is that "Increasingly, students who are enrolled at traditional campuses are using distance courses or course modules. These distance courses or academic modules are used by students in the library, as supplements to classroom-based courses, in residence halls and even at home. Distance is rapidly becoming a transparent factor in defining where learning occurs, where instruction originates, or where resources are housed and accessed."[30]

Collaborative Responses in a Competitive Market **-** the growth in the knowledge economy, and the centrality of universities in the development and extension of the knowledge base and the human capital which exploits it, has lead Slaughter and Leslie[31] to coin the phrase 'Academic Capitalism', to describe the activities of contemporary universities. Reviewing these trends, Buchbinder indicates that "the combination of underfunded universities, high tech developments, corporate needs, and the prevailing ideology have lead to a basic transformation in the university: a transformation to a university oriented to the market place,"[32] with the result that, as Abeles starkly observes, "Higher education is now in the global, competitive, marketplace. It is now a client driven environment where individuals are able to choose what they wish to acquire rather than accepting the dictates of institutions."[33] In the 21st century, traditional campus based universities will need to reconfigure themselves to reduce costs, and diversify programs and delivery modes to meet the challenge from other providers of higher education (both universities and corporations), in a fiercely competitive market which is no longer regional or national, but increasingly global.

As Dolence and Norris observe "Society is undergoing a fundamental transformation from the Industrial Age to the Information Age … All people, organisations, societies, and nations are affected, although not all at the same degree. Those who realign their practices most effectively to the Information Age will reap substantial benefits. Those who do not will be replaced or diminished by more nimble competitors."[34] Hence it is evident that "All universities, distance or not, need to become more flexible and responsive to change, whether technological, political, economic or demographic. A more flexibly organised university is a university better equipped to deal with change."[35] Similarly, Tait and Mills argue that in future the major distinction will not be between conventional and distance teaching universities, but "will lie between successful educational institutions using a range of teaching and learning strategies, substantially centred on ICTs and less successful institutions which, as in the industrial and business environment, will be taken over or will go bankrupt."[36]

The commonest response of universities to the challenges of the global market has been collaboration, usually with other universities, but increasingly with other major knowledge centred corporate players. A collaborative response enables a reduction of risk and a sharing of expertise, which means that critical mass (and market entry) can be quickly achieved. Even the larger and well-established providers are acting collaboratively - one of the earliest (and largest) such collaborative organisations has been the Western Governors University. In June 1996, Governors from Arizona, Colorado, Idaho, Nebraska, New Mexico, North Dakota, Oregon, Utah, Washington and Wyoming unanimously endorsed the plan for a new virtual Western Governors University, and were later joined by Alaska, Hawaii, Montana, Nevada, Oklahoma, Texas, Indiana and the territory of Guam. In 1997, Western Governors University signed collaborative agreements with the UK Open University, the Open Learning Agency in British Columbia, the Tokai University Educational System in Japan, and the Universidad Virtual del Instituto Tecnologico y de Estudios Superiores de Monterrey (ITESM) in Mexico.

Robin Mason, reviewing future trends in the global education market, agrees that collaboration is a way out of the dilemma faced by universities but that it is not easy and can take various forms with:

- a complementary partner from a different core business, but which is essential to global provision (e.g. a telecomms provider);
- an educational partner abroad, which has local knowledge but need more content and courses than it can produce locally;
- a consortia of universities, with each partner supplying courses to which all have access;
- international partners to develop courses jointly.

158 Mason, R., (1999), p.43.

159 Drew, R., Dew, P., Morris, D., Leigh, C., Curson, J., (1996), 'The Virtual Science Park', *British Telecommunications Engineering*, Vol.1, No.4, pp.322-329.

160 Kaukkonen, E., and Nieminen, M., (1999), "Modeling the Triple Helix from a Small Country Perspective", *Journal of Technology Transfer*, Vol 24, No.2&3, p.252.

161 Mason, R., (1999), p.15.

162 Vines, D., (April 1998), *California Virtual University: Academic Plan*, mimeo, p.1.

163 *Chronicle of Higher Education*, (2000), 'Enrollment Growth Remains Slow at Western Governors University', 14th January.

164 Berg, G., (1998), 'Public Policy on Distance Learning in Higher Education:California State and Western Governors Association Initiatives', *Education Policy Analysis Archives*, Vol. 6, No. 11.

165 Daniels, Sir John, (1999), 'The Intelligent Use of Technology', lecture delivered at the Telecom Applications Research Alliance, Halifax, Nova Scotia, Canada 12th April.

166 Peters, O., (2000), 'The Transformation of the University into and Institution of Independent Learning', (eds) Evans, T, and Nation, D., *Changing University Teaching: Reflections on Creating Educational Technologies*, (London: Kogan Page), p.20-1.

167 Thompson, D., (1999), 'From Marginal to Mainstream: critical issues in the adoption of information technologies for tertiary teaching and learning', in (eds) Tait, A., and Mills, R., *The Convergence of Distance and Conventional Education*, (London: Routledge) p.154.

168 Florida, R., (1995), 'Towards the Learning Region', *Futures*, Vol. 27, No.5, (1995) p.527-536.

169 Bjarnason, S., Davies, J., Farrington, D., Filden, J., Garrett, R., Lund, H., Middlehurst, R., Schofield, A., (2000), p.39.

170 Ibid, p.24.

of Hypermedia-Based Learning Environments', *Journal of Universal Computing Science*, Vol. 4 No 3, p.292-307.

147 Bates, A., (1995), p.236f.

148 Sumner, T., Taylor, J., (1998), 'New Media, New Practices: Experiences in Open Learning Course Design', *Human Factors in Computing Systems Conference* (CHI'98) Paper (Los Angeles: mimeo), p.4.

149 Nemirovski, G., Huel, E., Hirsekorn, H., Schlageter, G., (1998), 'Combining Online and Offline Learning within a Homogenous Environment', *Online Educa Conference Proceedings*, 4th International Conference on Technology Supported Learning, (Bonn: International Where and How), p.115.

150 Collis, B., (1999), 'Telematics-Supported Education for Traditional Universities in Europe', *Performance Improvement Quarterly*, Vol.12, No.2, p.39.

151 Harasim, L., (1993), 'Collaborating in cyberspace: Using computer conferences as a group learning environment', *Interactive Learning Environments*, Vol. 3, p.119-130.

152 Kerr, E, (1986), 'Electronic Leadership: A Guide to Moderating Online Conferences', *IEEE Transactions on Professional Communications*, Vol. 29 No.1, p.12.

153 McCollum, K., (1997), 'A professor divides his class in two to test value of on-line instruction', *The Chronicle of Higher Education*, Vol.43, No.24, p.23.

154 Paulsen, M., (1995a), 'Moderating educational computer conferences', in Berge, Z., & Collins, M., (eds.) *Computer mediated communication and the online classroom*, (Cresskill, NJ: Hampton Press).

155 Mason, R., (1999), 'The Impact of Telecommunications', in Harry, Keith, (ed) *Higher Education Through Open and Distance Learning*, (London: Routledge) p.34.

156 For a useful summary of some of the issues, see Watt, S., (1995), 'Teaching Through Electronic Mail' *KMI Discussion Paper KMI-TR-39*, (OU: mimeo); Hardy, V., (1992), 'Introducing Computer-Mediated Communications into Participative Management Education: the Impact of the Tutor's Role', *Education and Training Technology International*, Vol. 29, No2, p.325-331; Paulsen, M., (1995b), '*The Online Report on Pedagogical Techniques for Computer-Mediated Communications'*, [WWW document]. http://www.nettskolen.com/alle/forskning/19/cmcped.html

157 Bates, A., (1995), p.216.

In conclusion Mason states "my research leads me to predict incremental changes to universities, some rapid and some fundamental. Closures and amalgamations seem unavoidable, and purely campus-based institutions will become a small and marginalised sector, while international and global institutions, consortia and new providers will dominate the education and training market for life-long learning."[37] This concurs with a recent study of global trends in the virtual delivery of education which found that "we will see the emergence of a relatively small number of institutional providers who will dominate the education market through vast distribution networks and strategic partnerships."[38]

European/National Context

The increasing globalisation of higher education means both 'European' and 'national' contexts have declining significance, but there are developments at both levels which are relevant. Within Europe, there is a growing recognition that higher education must adapt and embrace new information and communication technologies. First, to meet the needs of the workforce which is demanding ever-higher skill levels as the knowledge economy unfolds. Second, to address the threat of corporate universities in the United States using new technologies to 'export' education to Europe. The *Research Agenda* for the EU Information Society Programme noted that "Universities no longer have a monopoly on knowledge. Companies are becoming more aware of the potential of the education market: large companies are already selling courses developed for their internal training needs, while new companies are offering an increasingly wider range of high-tech courses. One of the critical success factors for universities lies in their ability to address the lifelong learning market … universities are competing for the best students and it is very likely that students will take into account the modernity of the learning environment and it's capacity to properly prepare them to work in a global economy. This explains why open and distance learning is one of the most rapidly growing fields in education."[39] The scale of this task is such that "the breadth and depth of research needed cannot be undertaken by small communities of researchers on member states working at the point on intersection between education and computer science. A critical mass of research capacity can only be found at the European Union level."[40]

The 1994 Bangemann Report *Europe and the Global Information Society* recommended the development of lifelong learning for a changing society, and pointed to the need to "Promote distance learning centres providing courseware, training and tuition services tailored for SMEs, large companies and public administrations. Extend advanced distance learning techniques into schools and colleges" and argued for the "Development of a trans-European advanced network (high bandwidth, high definition, carrying interactive multimedia services) linking universities and research centres across Europe, with open access to their libraries."[41] The following year, the EU *White Paper on Education and Training*

argued that the key policy objectives should be "to give everyone access to a broad base of knowledge and to build up their abilities for employment and economic life."[42] More recently, the need to address the impact of changing patterns of higher education demand and delivery across the globe has now been recognised by the European Union, both collectively and in individual nation states. In June 1999 the Education Ministers from 28 European Nations, meeting in Bologna, signed a joint declaration acknowledging "the creation of the European area of higher education as a key way to promote citizens' mobility and employability and the Continent's overall development."[43]

The joint declaration acknowledged the threat posed to higher education in Europe by the potential growth in on-line educational delivery and the subsequent need to "look at the objective of increasing the international competitiveness of the European system of higher education … (through the) adoption of a system of easily readable and comparable degrees, … in order to promote European citizens' employability and the international competitiveness of the European higher education system (and the) promotion of the necessary European dimensions in higher education, particularly with regard to curricular development, inter-institutional cooperation, mobility schemes and integrated programmes of study, training and research."[44] These developments will be facilitated via the Information Societies Technologies strand under the 5th Framework Programme where (under Strand III.3.2 *The Flexible University*) the objective is "To integrate and demonstrate emerging technologies for the flexible University of the future through large-scale experiments (which) should cover co-operation between institutions in providing advanced facilities to allow learners to follow a personalised mix of courses, virtual learner mobility, and interaction between tutors and learners in new ways."[45]

The dangers to European universities of a policy of inactivity, or slower integration of ICT than has occurred in the USA, have been assessed by Robinson.[46] First, the USA providers, having fully supplied their home market, will try to exploit the EU markets and those in Eastern and Central Europe. Second, as the suppliers would be largely American, this would make European companies and universities little more that sub-contractors. As a result, the specific national needs and cultural diversities of European states would be secondary to financial considerations. Finally, without a strategic pan-European approach, individual states (pre-occupied with a need to develop national educational highways) would be tempted to form alliances with US corporations, in order to secure European market domination.

Universities in mainland Europe are starting to address the challenges of the new global educational environment. Hans Van Ginkel, Vice President of the Association of European Universities, stresses the need for a realistic approach based on collaboration: "No university is powerful enough on its own and can invest that many resources to excel in every field of higher education and research.

Lockwood, F. (ed), *Open and Distance Learning Today*, (London: Routledge) p.8.

131 Van der Brande, L., (1993), *Flexible and Distance Learning*, (New York: John Wiley) p.23.

132 Speake, T., and Powell, J., (14/11/1997), 'The missing link in multimedia', *Times Higher Education Supplement*, Multimedia, p.xii.

133 Ruesser, K., (1995), 'From Cognitive Modeling to the Design of Pedagogical Tools' in Vosniadou, S., de Corte, E., Glaser, R., Madl, H., (eds) *International Perspectives on the Design of Technology-Supported Learning Environments*, (Hillsdale NJ: Lawrence Erlbaum) p.81-103.

134 Thorpe, M., (1995), 'The Challenge Facing Course Design', in Lockwood, F., (ed), *Open and Distance Learning Today*, (London: Routledge) p.176.

135 Brittain, M., Chamber, M., Marriott, P., (1997), 'Design Considerations in the development and delivery of digital learning media', (mimeo) paper presented at the *ED-Media Conference*, Frieburg , Germany.

136 Laurillard, D., (1993), *Rethinking University Teaching: A Framework for the effective use of educational technology*, (London Routledge).

137 Laurillard, D., (1993), p.29, 104.

138 Chambers, M., (1999), 'The efficacy and ethics of using digital multimedia for educational purposes', in Tait, A., and Mills, R., (eds) *The Convergence of Distance and Conventional Education*, (London: Routledge) p.11.

139 Laurillard, D., (1993), p.178.

140 Bates, A., (1995), *Technology, Open Learning and Distance Education*, (London: Routledge,) p.202.

141 Reeves, C., (1997), *A Model of the Effective Dimensions of Interactive Learning on the World Wide Web* (University of Georgia: mimeo) p.3.

142 Daniel, J., (1998), *AAHE Bulletin*, Vol.50, No.9, p.11.

143 Bates, A., (1995), p.204.

144 Laurillard, D., (1993), p.226.

145 Grandgenett, N, Grandgenett, D, Topp, N, Fluckinger, J, Ostler, E, Mortensen, R., (1997), 'Integrating Technology into Teaching and Learning: Three Keys to the Kingdom' *Innovations in Education and Training International*, Vol. 34, No. 4, p.254.

146 Ruokamo, H., Pohjolainen, S., (1998), 'Pedagogical Principles for Evaluation

[114] Pratt, J., (1997), *The Polytechnic Experiment 1965-1992*, (Milton Keynes: OU/SRHE).

[115] Dahllöf, U., Goddard, J., Huttunen, J., O'Brian, C., Román, O., Virtanen, I.,(1998), p.29.

[116] Parjanen, L., (1997), *Open University in Finland*, (Ministry of Education: Helsinki), (trans by V. Mattila), p.19.

[117] Ibid., p.14.

[118] Ibid., p.15..

[119] Langlois, C., (1997), 'Information Technologies and University Teaching, Learning and Research' in Hlavicka, J., & Kveton, K., (eds.), *Proceedings* of Rufis '97 Conference: The Role of the University in the Future Information Society, p.187.

[120] Collis, B., (1999), 'Telematics-Supported Education for Traditional Universities in Europe', *Performance Improvement Quarterly*, Vol.12, No.2, p.39.

[121] McCormack, C., Jones, D., (1998), *Building a Web Based Education System*, (New York: Wiley), p.18-24.

[122] Arbeles, T., (1998), p.607.

[123] Tiffin, J., Rajasingham, L., (1995), *In Search of the Virtual Class: Education in an Information Society*, (London: Routledge) p.166.

[124] Bjarnason, S., Davies, J., Farrington, D., Filden, J., Garrett, R., Lund, H., Middlehurst, R., Schofield, A., (2000), p.14.

[125] As Eino Leino observed in *Suomalaisen Kirjallisuuden Historia* (1910), 'Literature is the country's interpreter. Literature is the nation's mirror. Without literature the nation is like a blind man, like a deaf man.'

[126] Crystal, D., (1999), 'The Death of Language', *Prospect*, November, p.56.

[127] Clark, R., (1984), 'Research on Student Thought Processes During Computer-based Instruction', *Journal of Instructional Development*, Vol.7, No.3, p.3.

[128] Skolnic, M., (1998), 'Higher Education in the 21st Century: Perspectives of an Emerging Body of Literature', *Futures*, Vol.30, No. 7, p.636.

[129] Daniel, Sir J., (1997), Speech delivered at the American Association of Higher Education, National Conference on Higher Education, 'Learning, Technology, and the Way We Work.' Washington DC March 16-19.

[130] Hawkridge, D, (1995), 'The Big Bang Theory in Distance Education' in

So we have to focus on the fields we are really excelling in and to find co-makers, other universities as well as other role players in society … It is this type of networking, the connecting of the best within reach, the linking of university services to societal change, that needs our attention."[47]

Similarly, a recent study undertaken on behalf of the UK Committee of Vice Chancellors and Principals accepted that "The truly mass institutions of high quality in both North America and continental Europe are of a scale of magnitude considerably greater than even the largest British University." As a result, "the huge cost of producing, and maintaining high quality courseware for a global market in the future … (is such that) … Investments in courseware needs are particularly daunting. No university in the UK on its own can possibly find the investment required to produce and maintain high quality courseware in all disciplines and combinations of disciplines, simultaneously."[48] This view was endorsed by an expert report to OECD which lamented the poor quality of learning material on the Internet, and stated that improving the quality of high-tech educational materials requires extensive co-operation and large investments for high-quality on-line learning material production.[49]

In 1996 the National Committee of Inquiry into Higher Education in the UK chaired by Lord Dearing, examined trends in higher education in other European countries and concluded that "in Europe there has been a broad evolution away from 'elite' higher education … (as) … Many of the countries experienced rapid student number growth between 1975 and 1980. After a slowdown in the early 1980s, in most countries the expansion was renewed after 1985."[50] Hence although there has been some variation, all European countries have experienced higher student numbers over the last two decades, and are searching for new ways of teaching to handle the common problems posed by a "massification" of higher education.

Financial pressures have been exerted on students, staff and management within all European universities - in essence all are trying to participate in the higher education learning experience which was established in the immediate post war period, but at a time of much increased usage of higher education, and much lower funding. Turner's analysis of changing patterns of funding higher education in Europe, for example, revealed that "The mechanisms for funding higher education, both teaching and research, have been changing radically in most European countries."[51] However, the impact of funding changes has had a much more differentiated effect than that of increasing student numbers, as the systems of funding vary between (and within) different nations. As the Dearing Report found "the systems of student support differ radically between those based on loan and on grant, and also in the extent of the proportion of student population covered. Many of the systems require evidence of satisfactory academic progress for students to be eligible for support."[52]

The Committee's in-depth cross national study showed that, with the exception of Spain, "none of the countries considered were expecting to change significantly the proportion of GDP which they devote to higher education."[53] Hence, most EU nations are raising the numbers of students but keeping funding levels constant, for example in France "Solutions are being sought as to how to secure reasonable per capita funding at a time of rapidly increasing demand for education."[54] Hence the problem that all European Universities are experiencing varies only in depth and intensity, with all looking for new ways to address this problem.[55] A cross national study by Jean-Paul de Gaudemar for the French Ministry of Research and Higher Education found that "in all OECD countries … mass tertiary education, the growing amount of public spending and the corresponding expansion in the siting of institutions has fused the two issues: the issue of equal access has quickly been joined by the issue of external impact on local development,"[56] leading him to stress that "it is vital to bring together education providers and employers at different territorial levels on an organised and permanent basis."[57]

In essence, the severity of the problems experienced varies between different European nations, but all universities are coming under increasing pressure. As Olli-Pekka Heinonen (the former Finnish Minister of Education and Science) observed "Institutions of higher education are in a cross fire of expectations. They are expected to promote the economy and employment, to provide solutions to global environmental problems, to be strong cultural centres, etc. The public at large expect them to solve the burning global, national and regional problems of our times. Young people place their hopes in higher education institutions, expecting to get qualifications which guarantee them a place in tomorrow's society."[58]

Regional/Local Context

At a macro level, universities are helping to develop the idea and reality of a Learning Region within the Learning Economy. Within a learning economy "the success of individuals, firms and regions, reflects the ability to learn; where change is rapid and old skills get obsolete and new skills are in demand; where learning includes skills and the building of competencies, not just increased access to knowledge; where learning is going on in all parts of society, not just high-tech sectors; and where net job creation is in knowledge intensive sectors."[59] The regional impact of the learning economy is widely accepted: "to be effective in this increasingly borderless global economy, regions must be defined by the same criteria and elements which comprise a knowledge-intensive firm … regions must adopt the principles of knowledge creation and continuous learning; they must in effect become knowledge creating or learning regions."[60]

At local/regional level, higher education has moved from being a minor service

93 Finnish Ministry of Trade and Industry, (1999), *White Paper on Industrial Policy (*Helsinki: Ministry of Trade and Industry) mimeo, p.58.

94 Finnish Ministry Of Labour (1999).

95 Pulkkinen, M., (1998), *University Research in Transition: Country Notes for Finland* (Paris: OECD), p.59.

96 Ibid, p.69.

97 Finnish Ministry of Education (1998), p.60.

98 Kaukonen, E., (1997), *The Evaluation of Scientific Research: Selected Experiences*, (Paris: OECD), p.19.

99 OECD (1998), p.75.

100 Numminen, S., (1996), *National Innovation Systems: Pilot Case Study of the Knowledge Power of Finland*, (Paris: OECD) p.28,32,99.

101 Pulkkinen, M., (1998), p.70.

102 Numminen, S., (1996), p.66.

103 Sperling, J., (1999), 'A Business Model of Higher Education in 2025', in M. Thorne (ed), *Universities in the Future*, (London: DTI), p.106.

104 For a comparison of the two approaches, see Karran and Pohjonen (1999).

105 Finnish Ministry of Education, (1999a), p.41f.

106 Ibid., p.55f.

107 Finnish Ministry of Education, (1999b), *Education in Finland,* (Helsinki Ministry of Education), p.26.

108 For information on modular systems, see Watson, D., Brooks, D., Coghill, C., Lindsay,R., Scurry, D., (1989), *Managing the Modular Course: Perspectives from Oxford Polytechnic*, (Milton Keynes: SRHE/OU Press).

109 Finnish Ministry of Education, (1998), p.50.

110 National Committee of Inquiry into Higher Education, (1997b), *Higher Education in the Learning Society*, (London: NICHE), p.133.

111 Sinko, M., Lehtinen, E., (1999), *The Challenges of ICT in Finnish Education*, (Atena: Helsinki) p.124.

112 Haapakorpi, A., (1995), 'The Recession in Finland and the Labour Market for Academic Degree Holders', *European Journal of Education*, Vol.30, No.1, p.108.

113 Finnish Ministry of Education, (1999b), p.24.

[77] SPRU (1996), *The Relationship Between Publicly Funded Basic Research and Economic Performance*, (Brighton, University of Sussex) mimeo, p.24-45.

[78] Henderson, R., Jaffe, A., Trajtenberg, M., (1998), 'Universities as a Source of Commercial Technology: A Detailed Analysis of University Patenting, 1965-1988', *Review of Economics and Statistics*, Vol.80, No.1, p.119-127.

[79] Balazs, K., (1996), 'Academic Entrepreneurs and their Role in Knowledge Transfer', *STEEP Discussion Paper No 37*, (Brighton, University of Sussex) mimeo.

[80] OECD, (1999), *Science, Technology and Industry Scoreboard 1999: Benchmarking Knowledge Based Economies*, (Paris: OECD).

[81] Martin, F., and Trudeau, M., D., (1999), p.58.

[82] OECD, (1998), *University Research in Transition*, (Paris: OECD), p.7f.

[83] Van Ginkel, H., (1995), 'University 2050: The Organisation of Creativity and Innovation', in *Universities in the 21st Century* (ed) Raisman, J., (London: National Commission on Education), p.65-86.

[84] Tavernier, K., (1991), 'Strategic Evaluation in University Management', *Higher Education Management*, Vol.3, No.3, p.259.

[85] Sitra (1998), *Quality of life, Knowledge and Competitiveness*, (Helsinki: Sitra), p.211.

[86] Finnish Ministry of Finance (1999), *Economic Bulletin* 25th November 1999, (Helsinki: Ministry of Finance) p.1,2.

[87] Finnnish Ministry of Finance (1998), *Benchmarking Finland: An Evaluation of Finland's Competitive Strengths and Weaknesses*, (Helsinki: Ministry of Finance).

[88] Mäenpää, K., Luukikainen, S., (1994), *Telecommunications: Clustering, Diversity and Competitiveness*. (Helsinki: Taloustieto Oy), p.96.

[89] Finnish Ministry Of Labour (1999), *Finland's National Action Plan for Employment 1999* [http://www.mol.fi/tpts/nape_part0.html]

[90] Ibid.

[91] Raivola, R., Vuorensyrja, M., (1998), *Osaaminen tietoyhteiskunnassa* (Helsinki: Sitra) p.180.

[92] Markkula, M., Suurla., R, (1998), *Passion to Learn: Benchmarking Good Lifelong Learning Practice*, IACEE Report No 9 (trans Eeva-Liisa Pitkanen) (Helsinki: Cosmoprint OY).

sector to a primary employer, with a central role in urban infrastructure renewal and re-skilling the local workforce. The deindustrialisation during the 1980's lead to the closure of many manufacturing firms, and the proliferation of small knowledge-based enterprises, primarily in the service sector. This, and the growth in student numbers, has meant that universities are often the largest employers in their regions. Few large cities or sub-regions in Europe are now without a university and some have as many as 30-40,000 university students, often with a similar number involved in other forms of post-16 education, leading to their descriptions as "UniverCities"- Paris, for example, has 13 universities with over 330,000 students. The effect of such universities on the local economy is often considerable - for example in 1999 there were more than 13,000 students at the University of Oulu, three-quarters of these coming from the two northernmost provinces of Lapland and Oulu with two-thirds of them finding jobs in this area. Approximately 2,000 new students start their studies each year. The total number of staff is more than 3,000. About 800,000 people live within the university's immediate sphere of influence which encompasses more than half the surface area of Finland. The university's general impact is seen most strongly in the business and cultural life of the area.

A study of the regional impact of universities in Finland[61] identified the interlinked impacts of universities on their hinterlands as follows:

- the direct economic effect through the purchasing power of staff and students (many of whom may be recruited from outside the region), and the associated multiplier effects, for example a cash-flow analysis of the University of Kuopio showed that although the University accounted for only 1.5% of total employment, the direct economic effects amounted to FIM 207 million, while the indirect effects were circa FIM 320 million;[62]
- the positive impact of highly qualified personnel on the region's skills base, allied to the changes in the role and functions of universities, caused by the needs and demands of the fast emerging knowledge society;
- the synergistic interaction between industries and universities, often through formal joint ventures (such as science parks), but also through continued professional updating courses. The growth, scope and performance of science parks developed in Finland by means of collaborative ventures between universities, public companies and local authorities, has been seen as an indicative bench mark of best practice within Europe;[63]
- via social and community developments, through which universities recruit students who are retained in the region after graduation;
- universities have a significant impact on civic activities and cultural life - a finding endorsed by a research study in the UK, *Universities and Communities*[64] which demonstrated that the role of individual universities in the social and

cultural life of their surrounding hinterland is growing and likely to increase.

Hence, the shift in role from minor to major employer following the decline of other industrial sectors, and the growth in the importance of knowledge as a major commodity, has accompanied an entrepreneurial attitude by universities seeking to supplement declining levels of central government funds. Most universities are proactively pursuing a role of partnership and collaboration with a variety of public and private sector organisations - regional offices of central government, county, district and town councils, health authorities, chambers of commerce, enterprise agencies, and industrial and commercial firms. Thus as the study of Eastern Finland universities indicated, "universities have much to offer through locally relevant knowledge production; as gateways to global information resources; in human capital formation through creating a flexible, adaptable workforce and in providing leadership within formal and informal local governance structures."[65] A study for the National Committee of Inquiry into Higher Education in the UK found that "The scope for exploiting the regional and sub-regional benefits of higher education is considerable. In an increasingly competitive global economy there is an evident need to develop higher-level skills, to make provision for lifetime retraining and to capitalise on the application of research findings in product and process innovations. Universities represent a considerable resource to address these challenges."[66]

The Role of Research and Technology Transfer

The opportunities provided by new technologies to facilitate new ways of teaching and learning has meant that the other primary function of universities, research, tends to be over-looked when considering what a virtual university would achieve. This is surprising, given that the World Wide Web was originally created by Tim Berners-Lee to ensure widespread dissemination of results from the international research undertaken at the CERN laboratories. However, the research role of Universities is comparatively recent.[67] The first universities were possibly established within Arabic cultures as teaching institutions - the term "baccalaureate" being derived from the Arabic *bihaqq al-riwaya*, meaning "with the right to teach on the authority of another."[68] The increasing role of research in universities started initially within German universities - in 1809 Humboldt argued that the teacher did not exist just to serve the needs of students but that both have a common role in the pursuit of knowledge.[69] However as late as 1853, Newman contended that "to discover and to teach are distinct functions; they are also distinct gifts, and are not commonly found united in the same person. He, too, who spends his day in dispensing his existing knowledge to all comers is unlikely to have either leisure or energy to acquire new."[70] In the United States too, up until World War II, universities played a relatively minor role in the nation's scientific enterprise. However Roosevelt's perception that the role played by university scientists to help win the war could be extended to provide specific

63 For a cross-European Survey, see Welsh Development Agency (1997), *A Matter of Connections: Links Between development agencies and universities*, (Cardiff: WDA).

64 Goddard, J., Charles, D., Pike, A., Potts, G., Bradley, D., (1994), *Universities and Communities*, (London: CVCP).

65 Dahllöf, U., Goddard, J., Huttunen, J., O'Brian, C., Román, O., Virtanen, I., (1998), p.9.

66 Robson, B., Drake, K., Deas, I., (1997), National Committee of Inquiry into Higher Education, Research Report *9 Higher Education and the Regions*, (London: NICHE) p.186.

67 See Schuller, T., (1995), *The Changing University?* (London, S.R.H.E./O.U. Press).

68 See Leinster-Mackay, D., (1978), 'The idea of a University: A historical perspective on some precepts and practices', *Vestes*, Vol. 20 No. 4, p.28.

69 Humboldt, W., (1970), 'On the spirit and the organisational framework of intellectual institutions in Berlin', *Minerva*, Vol. 8, p.242-267 (original work published 1809).

70 Newman, J.H., (1853), *The Idea of a University*, (NY: Doubleday), p.10.

71 Bush, Vannevar, (1945), *Science The Endless Frontier,* A Report to the President by Vannevar Bush, Director of the Office of Scientific Research and Development, July 1945 (United States Government Printing Office: Washington).

72 For a consideration of these issues see Halsey, A.H., (1992), *Decline of Donnish Dominion: The British Academic Profession in the 20th Century*, (Oxford: Clarendon Press).

73 OECD (1994), *Main Definitions and Conventions for the Measurement of Research and Experimental Development: A Summary of the Frascati Manual* OCDE/GD(94)84, (Paris: OECD), p.7.

74 Massachusetts Technology Collaborative, (1999), *Technology and Economic Growth: The Structure and Performance of Technology-Intensive Industries*, [http://www.mtpc.org/docs/rprtteg1.htm]

75 Martin, F., Trudeau, M., (1998), 'The Economic Impact of University Research', *Research File*, Vol. 2 No. 3, p.1.

76 Martin, F., and Trudeau, M., (1999), 'Measuring the Economic Impact of Universities: Canada' in Gray, H., (ed), *Universities and the Creation of Wealth*, (London: SRHE), p.57.

[47] Van Ginkel, H., (1996), 'Networking and Strategic Alliances: Dynamic Patterns of Organisation and Cooperation' *Journal of the Association of European Universities*, No 109, p.97.

[48] Newby, H., (1999), 'Higher Education in the 21st Century: Some Possible Futures', *Perspectives*, Vol. 3, No. 4, p.110

[49] Leer, A., (1998), 'The Market for Educational Software and Multimedia', Discussion Paper for the OECD *National Expert Meeting on New Developments in Educational Software*, (Paris: mimeo), June 4-5.

[50] National Committee of Inquiry into Higher Education, (1997a), 'Higher Education in Other Countries', *Higher Education in the Learning Society*, (London: NICHE) Appendix 5, p.118.

[51] Turner, D., (1996), 'Changing Patterns of Funding Higher Education in Europe', *Higher Education Management*, Vol. 8 No. 1, p.102.

[52] National Committee of Inquiry into Higher Education, (1997a), p.122.

[53] Ibid.

[54] Ibid., p.31

[55] See for example Wagner, A., (1996), 'Financing Higher Education: New Approaches, New Issues', *Higher Education Management*, Vol. 8, No. 1, (March 1996), p.9-17.

[56] de Gaudemar, J., (1997), 'The Higher Education Institution as a Regional Factor', *Higher Education Management*, Vol.9 No.2, p.54.

[57] Ibid., p.63.

[58] Heinonen, O., (1997), 'What are National Authorities Expecting from Higher Education Institutions?', *Higher Education Management*, Vol. 9 No. 2, p.7.

[59] Goddard, J., (1997), *Universities and Regional Development: An Overview*, OECD Project in the Response of Higher Education to regional needs, (OECD: Paris) p.5.

[60] Florida, R., (1995), 'Towards the Learning Region', *Futures*, Vol. 27, No5, p.532.

[61] Dahllöf, U., Goddard, J., Huttunen, J., O'Brian, C., Román, O., Virtanen, I., (1998), *Towards the Responsive University: The Regional Role of Eastern Finland Universities*, (Helsinki: Edita), p.7f.

[62] Ibid, p.57.

benefits during peacetime, lead to the publication of Vannevar Bush's influential report *Science: The Endless Frontier*,[71] which signaled a major expansion in the role of research universities in the USA. Before this, the American graduate school, with its primary focus on research and higher learning, had grown out of the training of many American scholars in European universities, and an influx of intellectuals into the USA prior to the outbreak of war.

The initial role for research in universities, was conceived in terms of a general public good. Hence academics pursued research solely to extend the boundaries of knowledge, and both in considering new avenues of research, and assessing the outcomes of their work, they were not concerned with the practical application (if any) of research. Similarly, in disseminating their research results through lectures and seminars, minimal consideration was given to whether such knowledge adequately prepared students for their employment after graduation. This ethos, which centred on the absolute freedom of academics to determine the content of studies and the direction of research, was seen as crucial to the idea of university autonomy.[72] Additionally, this emphasis on 'knowledge for the sake of knowledge' lead universities to undertake basic research, and leave the exploitation of the new knowledge which resulted, to commercial firms and businesses. This schism between 'pure' and 'applied' research is acknowledged in the 'Frascati' definition of research drawn up by the OECD which distinguishes between:

- **Basic research** - experimental or theoretical work, undertaken to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any specific application or use in view.
- **Applied research** - also original investigation undertaken to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.
- **Experimental development** - systematic work, drawing on existing knowledge gained from research and/or practical experience, that is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.[73]

This separation between pure and applied research, and the fact that 'pure' research is undertaken by universities and often requires substantial resources (especially for the natural sciences), caused the allocation of university research funds by national governments to grow substantially. In the USA, for example, more than $20.6 billion ($56 million per day) was spent on academic research in 1993, and universities now account for 12.8% of total R&D. Moreover almost half of the 'basic' research in the US is now undertaken within universities, who commit approximately two thirds of their research budgets to fundamental research, with applied research (26%) and development (8%) making up the remainder.[74] Similarly in Canada, university research sustains $5 billion of GDP and results in

more than 81,000 jobs, which translated into almost one percent of Canada's 1994-95 GDP and more than 0.5 % of all jobs.[75] When increases in national output attributable to the higher productivity of graduates is included, every dollar invested in university R&D in Canada lead to an additional $7.5 in GDP.[76]

In addition to an increase in the stock of knowledge, an analysis conducted for the UK Government on the effect of basic research on economic performance identified:[77]

- **New instrumentation and methodologies** – new research often requires new laboratory tools, some of which have a wider commercial application (the extended use of the World Wide Web, for example, which was originally set up to disseminate research results), or may be utilised by another scientific discipline (as when, for example, X-ray crystallography was used to decipher the DNA double helix).
- **Supply of skilled graduates** - graduates from 'basic' research projects enter industry with advanced levels of training, and membership of international scientific networks.
- **Professional networks** - the importance of fundamental research provides researchers with entry into informal high level cutting edge research communities. Additionally, these networks enable companies to exchange information and personnel with university research teams.
- **Technological Problem Solving** - the results of high level basic research can often have direct implications for industries - as with the growth of the biotechnology and bioengineering industries following the mapping of DNA.
- **Creation of new firms** - there is firm evidence that academics are now much more inclined to seek fiscal rewards for their research through patent registration,[78] but the extent to which university academics create their own companies varies cross-nationally, being more typical in the United States than elsewhere.[79]

Just as the accelerating progress of communications and information technologies has increased the need for new skills and enabled the development of new ways of learning, it has also radically altered the role and operation of university research. During the industrial revolution, universities served few of industry's needs, and kept a deliberate distance from it. However, new technologies have produced a post-industrial knowledge based economy in which universities are now not peripheral but are crucially involved in the production and transfer of the central commodity - knowledge itself. Hence, within the knowledge based economy and the Information Society, the research activities of universities are vital factors in determining economic success. A recent OECD benchmarking study[80] revealed that the knowledge based industries have been outpacing the growth of GDP for many years in virtually all OECD countries. In OECD-wide GDP, the share of

31 Slaughter, S., Leslie, L., (1997), *Academic Capitalism*, (Baltimore and London: John Hopkins University Press).

32 Buchbinder, H., (1993), 'The market oriented university and the changing role of knowledge', *Higher Education*, Vol.26, p.332.

33 Abeles, T., (1998), p.606.

34 Dolence, M., Norris, D., (1995), *Transforming Higher Education: A Vision for Learning in the 21st Century*, (Ann Arbor: Society for College and University Planning), p.2.

35 Vermeer, R., (1999), 'Building tools for flexibility', in (eds) Tait, A., and Mills, R., *The Convergence of Distance and Conventional Education*, (London: Routledge) p.163.

36 Tait, A., and Mills, R., (1999), 'The Convergence of Distance and Conventional Education', in (eds) Tait, A., and Mills, R., *The Convergence of Distance and Conventional Education*, (London: Routledge) p.3.

37 Mason, R., (1998), *Globalising Education: Trends and Applications*, (London: Routledge) p.153.

38 Farrell, G., (1999), *The Development of Virtual Education: A Global Perspective* (Vancouver: The Commonwealth of Learning) p.4.

39 Weets, G., (1998), *Information Society Programme: Research Agenda for Technologies for Knowledge and Skills Acquisition*, (Brussels, EU mimeo) p.7.

40 Ibid., p.1.

41 High Level Group on the Information Society, (1994), *Europe and the Global Information Society* (The Bangemann Report) (Brussels: European Commission), Chapter 4.

42 European Commission (1995), *Teaching and Learning: Towards the Learning Society*, White Paper on Education and Training, (Brussels: E.U), p.9.

43 European Ministers of Education (1999), *The European Higher Education Area*, (Bologna: mimeo) p.1.

44 Ibid, p.2.

45 European Commission, (1999), http://www.echo.lu/ist/ka3/intro.html [WWW document].

46 Robinson, A., (1996), 'Policy Implications for Distance Education in the European Information Society' in Evans, T., and Nation, D., (eds), *The Opening Education: Policies and Practices from Open and Distance Education*, (London: Routledge) p.29.

[17] Thurow, L., (1990), 'The State of American Competitiveness and How it Can Be Improved' speech made at the Xerox Quality Forum II, July31st-August 2nd, Leesburg, Virginia.

[18] Association of Graduate Recruiters, (1995), *Skills for Graduates in the 21st Century*, (Cambridge: A.G.R.), p.5.

[19] Botkin, J., Elmandjra, M., Malitza, M.,(1979), *No Limits to Learning: Bridging the Human Gap*, (Oxford: Pergamon).

[20] OECD (1996), *The Knowledge-Based Economy*, (Paris: OECD), p.13.

[21] Robertson, D., (1999), 'Knowledge Societies, Intellectual Capital, and Economic Growth' in Gray, H., (ed), *Universities and the Creation of Wealth*, (London: SRHE), p.33

[22] Evans, T., and Nation, D., (1996), 'Opening Education: Global lines, local connections' in Evans, T., and Nation, D., (eds), *The Opening Education: Policies and Practices from Open and Distance Education*, (London: Routledge) p.3.

[23] Keegan, D., and Rumble, G., (1982), 'The DTUs: an appraisal', in G. Rumble and K. Harry (eds), *The Distance Teaching Universities*, (London: Croom Helm). p.248.

[24] Bjarnason, S., Davies, J., Farrington, D., Filden, J., Garrett, R., Lund, H., Middlehurst, R., Schofield, A., (2000), *The Business of Borderless Education: UK perspectives: Summary Report*, (London: CVCP) p.10.

[25] Abeles, T., (1998), 'The Academy in a Wired World', *Futures*, Vol.30, No.7, p.604.

[26] Meister, J., (1998), *Corporate Universities: Lessons in Building a World Class Workforce*, (New York: McGraw Hill) p.268, 272.

[27] Gubernick, L., and Ebeling, A., (1997), 'I got my degree via email' *Forbes On-Line*, [WWW document]. http://www.forbes.com/forbes/97/0616/5912084a.htm

[28] Sadlak, J., (1998), 'Globalisation and Concurrent Challenges for Higher Education' in Peter Scott (ed), *The Globalisation of Higher Education*, (London: SRHE) p.103.

[29] McIsaac, M., (1999), 'Distance Learning: The US Version', *Performance Improvement Quarterly*, Vol. 12, No. 2, p.28.

[30] Hall, J., (1996), 'Electronic Technology and the Modern University' in Evans, T., and Nation, D., (eds), *The Opening Education: Policies and Practices from Open and Distance Education*, (London: Routledge) p.12.

this broadly defined group (i.e. high and medium high technology manufacturing industries and services such as finance, insurance and communications) is now more than 50%, up from 45% in 1985, and in all countries, knowledge based services are now the largest sector. Since 1985, knowledge based industries have increased fastest in Korea, Portugal, Australia, the UK, Japan and Finland. Hence information and communication technologies are the major driver of the knowledge based economy, and how universities will use their research capabilities to adopt and master these technologies will determine future national prosperity. Hence "in an age where economic growth is increasingly driven by knowledge generation, … university research activities must be seen as indispensable in a knowledge intensive, globally competitive marketplace."[81]

Universities are having to evolve new roles and configurations to cope with higher student numbers and more diverse learning needs, while simultaneously retaining their commitment to long-term basic research. To try to pinpoint the trends in university research and map out the longer term implications of these changes, the OECD commissioned a major cross national study on *University Research in Transition*. The study identified the following:[82]

- **Declining government R&D finance** – Government research and development (R&D) budgets are falling in OECD countries, causing a leveling off, or decline, in university research funding, so that universities are seeking new sources of support.
- **Changing nature of government finance** – Government research funding is becoming mission-oriented, contract-based and more dependent on output and performance criteria.
- **Increasing industry R&D finance** – Private industry is funding an increasing share of university research, which is leading universities to perform research more directly aimed at potential commercial exploitation.
- **Growing demand for economic relevance** – Universities are under pressure to pursue research which can contribute to the innovation systems of their national economies.
- **Increasing systemic linkages** – Universities are encouraged to enter joint ventures and co-operative research with industry, government facilities, and other research institutions to enhance the effectiveness of networks and feedback loops in national innovation systems.
- **Growing research personnel concerns** – An aging scientific workforce, along with declining interest in some scientific areas by potential entrants, raises concerns about the future availability of well-trained researchers, while the training of researchers is changing.
- **Internationalisation of university research** – Globalisation, resulting from advances in information and communications technologies, is making research

more competitive and leading to specialisation.

- **A changing role** – Universities are seen as essential to the knowledge-based economy, so although the role of universities is changing, no nation will consent to a decline in the research, training or knowledge-transfer capabilities of their higher education systems.

A notable aspect of the changing relationship between universities and businesses has been the development of Science Parks. The first Science Park was set up in San Francisco in 1949 jointly between Stanford University and Helwett Packard. This was followed by the Raleigh Durham Research Triangle in North Carolina involving the State University, Duke University and the University of North Carolina at Chapel Hill. The rapid growth in Science Parks in the 1960's in the USA to over 100, lead to the first Science Parks in Europe in the 1970's such as Heriot-Watt University Research Park in Scotland and ZIRST at Grenoble in France. In the last twenty years the number of Science Parks has increased rapidly, along with the genesis of the technopolis where new towns are formed around one or more Science Parks.

The term 'Science Park' includes initiatives such as Research Parks, Technology Transfer Companies, etc. The objectives of Science Parks normally include the following:

- to encourage and facilitate the formation and growth of new businesses based on the research knowledge and expertise available within a University;
- to act as a catalyst for changes in a region, both in terms of providing new sources of employment in an area of, perhaps, declining traditional industries, and in helping to change the perceptions of the area, showing that it can create, attract and support new forms of industry;
- to build up an established infrastructure of capable, modern subcontracting companies, based initially on the needs and encouragement of the Science Park tenants;
- to act as a mechanism in a regional policy of upgrading the sophistication and added value of existing industries by providing a location in which continuous and close technical support can be given to existing local companies which have purchased licences to manufacture and market products which are new to that region or country;
- to provide a source of income for a University or centre of research to assist the further development of the parent institution, via the sale of services or rental income.

Despite the growth in Science Parks, there has always been a tension between Universities and Commerce. The academic community perceives its primary

Footnotes

1 Finnish Ministry of Education, (1999a), White Paper *Education, Training and Research in the Information Society: A National Strategy for 2000-2004* (Helsinki: Finnish Ministry of Education) p.14.

2 Finnish Ministry of Education, (1998), White Paper *Higher Education Policy in Finland* (Helsinki: Finnish Ministry of Education) p.26.

3 Ibid, p.57.

4 Finnish Ministry of Education, (1999a), p.42.

5 Karran, T., and Pohjonen, J., (1999), 'Towards the Virtual C@mpus: Possibilities, Problems, and Practicalities', EADTU Conference, Milton Keynes, mimeo.

6 Finnish Ministry of Education, (1999a), p.41.

7 Olio, D., (1998), *From Traditional to Virtual: the New Information Technologies*, (UNESCO: mimeo) p.4.

8 Farrell, G., ed., (1999), *The Development of Virtual Education: A Global Perspective*, (Vancouver: The Commonwealth of Learning), p.2f.

9 UNESCO, (1998), *Higher Education in the 21st Century: Vision and Action, Conference Invitation* (UNESCO, mimeo), p.1.

10 UNESCO, (1998), *Higher Education in the 21st Century: Towards an Agenda 21 for Higher Education* (UNESCO: mimeo), p.5.

11 Gladieux, L., and Swail, W., (1999), *The Virtual University and Educational Opportunity,* (Washington: The College Board), p.11.

12 Naughton, J., (1999), 'This is where it's @', *The Observer Review*, 22nd August 1999, p.3.

13 Leiner, B., Cerf, V., Clark, D., Kahn, R., Kleinrock, L., Lynch, D., Postel, J., Roberts, L., Wolff, S., (1997), 'A Brief History of the Internet' *On The Internet*, [WWW document]. http://www.isoc.org/internet/history/brief.html

14 Dias, M., (1994), 'New Trends in Interuniversity Co-operation at Global Level', *Higher Education Managemen*t, Vol. 6 No 1, p.107.

15 UNESCO Divisions of Higher Education and Statistics, (1998), *World Statistical Outlook on Higher Education: 1980-1995* (UNESCO: mimeo), p.6.

16 Bligh, D., (1995), 'International Education: Australia's Potential Demand and Supply', (mimeo) research paper presented to the 1995 *International Education Conference*, Brisbane, October.

Conference Invitation (UNESCO: mimeo).

Van der Brande, L., (1993), *Flexible and Distance Learning*, (New York: John Wiley).

Van Ginkel, H., (1995), 'University 2050: The Organisation of Creativity and Innovation', in *Universities in the 21st Century* (ed) J. Raisman, (London: National Commission on Education), p.65-86.

Van Ginkel, H., (1996), 'Networking and Strategic Alliances: Dynamic Patterns of Organisation and Cooperation' *Journal of the Association of European Universities*, No 109, p.91-106.

Vermeer, R., (1999), 'Building tools for flexibility', in (eds) Tait, A., and Mills, R., *The Convergence of Distance and Conventional Education*, (London: Routledge) p.161-174.

Vines, D., (April 1998), *California Virtual University: Academic Plan*, mimeo.

Wagner, A., (1996), 'Financing Higher Education: New Approaches, New Issues', *Higher Education Management*, Vol. 8, No. 1, p.9-17.

Watson, D., Brooks, D., Coghill, C., Lindsay,R., Scurry, D., (1989), *Managing the Modular Course: Perspectives from Oxford Polytechnic*, (Milton Keynes: SRHE/OU Press).

Watt, S., (1995), 'Teaching Through Electronic Mail' *KMI Discussion Paper KMI-TR-39*, (OU: mimeo).

Weets, G., (1998), *Information Society Programme: Research Agenda for Technologies for Knowledge and Skills Acquisition*, (Brussels, EU mimeo).

Welsh Development Agency (1997), *A Matter of Connections: Links Between development agencies and universities*, (Cardiff: WDA).

research role in terms of:

- pursuing collaborative "basic" research;
- supporting a free exchange of ideas and information that result from research;
- guaranteeing academic freedom to enable objective enquiry;
- upholding the probity of research.

By contrast industrial and commercial companies:

- engage in directed applied research;
- endeavour to maintain the secrecy of industrial ideas and processes through patents and copyrights;
- attempt to defend a competitive market position through patented products.

Hence, until recently, universities were not likely to become involved with applied research with companies, indeed given the conflict of interests outlined above, the outputs from such collaboration were often considered less academically valid. Universities and academics who wished to collaborate with industry often found that they were unable to benefit commercially from their discoveries, because the infrastructure did not exist within academia to support the transfer of university knowledge outputs to the wider community, through the patenting and copyrighting of inventions and discoveries. Additionally, university staff attempting research with industry and business often found that such research was less likely to secure advancement within an academic career structure, where articles in peer reviewed subject journals are viewed more favourably that joint patent applications with companies.

Within the post-industrial knowledge based economy, the position of universities has altered. Instead of being on the periphery of the productive processes in the economy, they are now in the position of being primary producers of the central commodity - new knowledge. ICT speeds up the flow of knowledge and, by extension, the volume of knowledge - even simple changes like email radically alter the way we communicate. Estimates have show that growth in the volume of knowledge is accelerating, the amount of knowledge can now double every five years.[83] Hence ITC has shifted higher education from an elitist service to a marketable product. As Tavernier[84] has observed, because the production of knowledge is no longer location bound, it has become a real factor of production, which can be bought and sold, imported and exported. However unless this commodity is quickly made available to the markets, its utility declines. Hence universities are now involved not only in the process of protecting the access rights to the knowledge products they create (though patents and intellectual property rights), they are also committed to the process of technology transfer.

Summary

In order to address the challenges of operating successfully within the contexts described above, a national virtual university must be able to:

- *cope with a large increase in the demand for higher education, across the globe, in which the dominant languages for tuition will be English, followed by Chinese and Spanish;*
- *provide courses which address the need for new and emerging knowledge sets, and instill not just subject knowledge but interpersonal skills and competence appropriate to, and demanded by, firms operating in increasingly global markets;*
- *enable students to undertake life-long learning, and provide them with professional updating and skills upgrading courses throughout their working lives;*
- *be customer focussed by demonstrating flexibility in respect of individual study programs, entry and exit points and modes of delivery;*
- *compete with newly emerging educational providers, both profit making universities, and corporate training providers;*
- *realise the benefits of collaboration with other universities and partnerships with companies to achieve viability, protect and enhance market share, and have a global reach;*
- *source and secure government and private sector funding to undertake fundamental high level research, jointly with other universities and companies and exploit the results through technology transfer;*
- *undertake a widening portfolio of responsibilities, much broader than the original remit of knowledge creation and transmission, in an increasingly competitive environment, but with greater efficiency and lower funding levels.*

John Hopkins University Press).

Skolnic, M., (1998), 'Higher Education in the 21st Century: Perspectives of an Emerging Body of Literature', *Futures*, Vol.30, No. 7, p.635-650.

Speake, T., and Powell, J., (14/11/1997), 'The missing link in multimedia', *Times Higher Education Supplement*, Multimedia, p.xii.

Sperling, J., (1999), 'A Business Model of Higher Education in 2025', in M. Thorne (ed), *Universities in the Future*, (London: DTI), p.104-119.

SPRU (1996), *The Relationship Between Publicly Funded Basic Research and Economic Performance*, (Brighton, University of Sussex) mimeo.

Sumner, T., Taylor, J., (1998), 'New Media, New Practices: Experiences in Open Learning Course Design', *Human Factors in Computing Systems* Conference (CHI'98) Paper (Los Angeles: mimeo).

Tait, A., and Mills, R., (1999), 'The Convergence of Distance and Conventional Education', in (eds) Tait, A., and Mills, R., *The Convergence of Distance and Conventional Education*, (London: Routledge) p.1-4.

Tavernier, K., (1991), 'Strategic Evaluation in University Management', *Higher Education Management*, (Vol.3, No.3, Nov.1991) p.257-267.

Thompson, D., (1999), 'From Marginal to Mainstream: critical issues in the adoption of information technologies for tertiary teaching and learning', in (eds) Tait, A., and Mills, R., *The Convergence of Distance and Conventional Education*, (London: Routledge) p.150-160.

Thorpe, M., (1995), 'The Challenge Facing Course Design', in Lockwood, F., (ed), *Open and Distance Learning Today*, (London: Routledge) p.175-184.

Thurow, L., (1990), 'The State of American Competitiveness and How it Can Be Improved' speech made at the Xerox Quality Forum II, July31st-August 2nd, Leesburg, Virginia.

Tiffin, J., Rajasingham, L., (1995), *In Search of the Virtual Class: Education in an Information Society*, (London: Routledge).

Turner, D., (1996), 'Changing Patterns of Funding Higher Education in Europe', *Higher Education Management*, Vol. 8 No. 1, p.101-111.

UNESCO Divisions of Higher Education and Statistics, (1998), *World Statistical Outlook on Higher Education: 1980-1995* (UNESCO: mimeo).

UNESCO, (1998), *Higher Education in the 21st Century: Towards an Agenda 21 for Higher Education* (UNESCO: mimeo).

UNESCO, (1998), *Higher Education in the 21st Century: Vision and Action*,

Independent Learning', (eds) Evans, T, and Nation, D., *Changing University Teaching: Reflections on Creating Educational Technologies*, (London: Kogan Page), p.10-23.

Pratt, J., (1997), *The Polytechnic Experiment 1965-1992*, (Milton Keynes: OU/ SRHE).

Pulkkinen, M., (1998), *University Research in Transition: Country Notes for Finland* (Paris OECD).

Raivola, R., Vuorensyrja, M., (1998), *Osaaminen tietoyhteiskunnassa* (Helsinki: Sitra).

Reeves, C,. (1997), 'A Model of the Effective Dimensions of Interactive Learning on the World Wide Web', (University of Georgia: mimeo).

Robertson, D., (1999), 'Knowledge Societies, Intellectual Capital, and Economic Growth' in Gray, H., (ed), *Universities and the Creation of Wealth*, (London: SRHE), p.18-35.

Robinson, A., (1996), 'Policy Implications for Distance Education in the European Information Society' in Evans, T., and Nation, D., (Eds), *The Opening Education: Policies and Practices from Open and Distance Education*, (London: Routledge) p.21-32.

Robson, B., Drake, K., Deas, I., (1997), National Committee of Inquiry into Higher Education, Research Report 9 *Higher Education and the Regions*, (London: NICHE).

Ruesser, K., (1995), 'From Cognitive Modeling to the Design of Pedagogical Tools' in Vosniadou, S., de Corte, E., Glaser, R., Madl, H., (eds) *International Perspectives on the Design of Technology-Supported Learning Environments*, (Hillsdale NJ: Lawrence Erlbaum) p.81-103.

Ruokamo, H., Pohjolainen, S., (1998), 'Pedagogical Principles for Evaluation of Hypermedia-Based Learning Environments', *Journal of Universal Computing Science*, Vol. 4 No 3, p.292-307.

Sadlak, J., (1998), 'Globalisation and Concurrent Challenges for Higher Education' in Scott, P., (ed), *The Globalisation of Higher Education*, (London: SRHE/O.U.Press) p.100-107.

Schuller, T., (1995), *The Changing University?* (London, S.R.H.E./O.U. Press).

Sinko, M., Lehtinen, E., (1999), *The Challenges of ICT in Finnish Education*, (Atena: Helsinki).

Sitra (1998), *Quality of life, Knowledge and Competitiveness*, (Helsinki: Sitra).

Slaughter, S., Leslie, L., (1997), *Academic Capitalism*, (Baltimore and London:

3 The Finnish Environment

The Social and Economic Environment

In addition to meeting the general challenges affecting an international university in the 21st century, the proposed Virtual University will also need to be capable of addressing the specific national needs of Finland. These needs arise from historical economic and social circumstances and the personal aspirations of the people, as expressed via the policy programmes of their elected representatives. The national vision is that "Finnish society should develop and apply in an exemplary, exhaustive and sustainable manner the opportunities offered by the information society so as to improve expertise, international competitiveness, interaction and the quality of life."[85] Clearly, an in-depth longitudinal and cross-sectoral study of the Finnish society and economy is both inappropriate and beyond the scope of this paper. However, any large scale project such as a national virtual university, which fails to take account of the society and economy it is designed to serve, risks the high financial, social and political costs associated with possible failure, more especially where the project forms a major part of the strategy to deliver a knowledge based economy.

The *Economic Bulletin* produced by the Ministry of Finance in September 1999 reported that "Economic prospects in Finland are favourable. Export volumes have picked up since the low volumes of the early months of the year; business expectations have become distinctly positive, and household confidence has also strengthened. Moreover the number of jobs has continued to grow fast. … The number of jobs increased more than anticipated this year, and the labour force shortages are becoming more widespread. Labour demand has been highest in the service industries, construction activities and in the electricity and electronics industries."[86] More significantly, an in-depth bench-marking exercise of Finland's strengths and weaknesses substantiates the nation's economic competitiveness[87] and highlights the growing impact of knowledge based economies, more especially the telecommunications sector which is expected to overtake the forest industry as the country's largest exporter.[88] The impact of telecommunications within the Finnish economy is confirmed by the OECD data shown in table 1 and diagram 1 below. These figures demonstrate that Finland is now among the world's leading knowledge based economies, and is experiencing a very fast rate of growth in this area.

Interwoven within this strategy of greater integration of ITC at home and in the workplace, is a continuing commitment to increasing access to education and training, as a means of improving equality of opportunity and combating sexism, ageism, unemployment and social exclusion, especially among groups particularly at risk. Hence the *National Action Plan for Employment* acknowledges that "Equal educational and training opportunities according to the principle of lifelong learning are the right of every citizen regardless of place of residence, age, sex, language and economic position. Training can help erode the rigid gender divisions

between occupations. Education policy can also help prevent exclusion and deal with the challenges of aging workers."[89] The increased use of ITC can be especially important in enabling people with disabilities to undertake economically useful and personally fulfilling work, and this has been recognised through measures whereby "The access of young people with severe disabilities to working life will be improved, people with disabilities outside the labour market will be encouraged to return to work, and apprenticeship training for people with disabilities on rehabilitation allowance will be promoted."[90] Similarly, education and training strategies are to be developed to address the problems of the established Sami and Roma ethnic minorities within Finland.

Table 1: % Shares of high-technology industries in total manufacturing

	Exports		Value added	
	1970	1993	1970	1994
Australia	2.8	10.3	8.9	12.2
Austria	11.4	18.4	..	..
Belgium	7.2	10.9	..	..
Canada	9.0	13.4	10.2	12.6
Denmark	11.9	18.1	9.3	13.4
Finland	**3.2**	**16.4**	**5.9**	**14.3**
France	14.0	24.2	12.8	18.7
Germany	15.8	21.4	15.3	20.1
Greece	2.4	5.6	..	..
Ireland	11.7	43.6	..	..
Italy	12.7	15.3	13.3	12.9
Japan	20.2	36.7	16.4	22.2
Netherlands	16.0	22.9	15.1	16.8
New Zealand	0.7	4.6	..	5.4
Norway	4.7	10.7	6.6	9.4
Spain	6.1	14.3	..	13.7
Sweden	12.0	21.9	12.8	17.7
United Kingdom	17.1	32.6	16.4	22.2
United States	25.9	37.3	18.2	24.2

Source: OECD, *The Knowledge Based Economy*, (OECD: Paris) p.9

in Other Countries', *Higher Education in the Learning Society*, (London: NICHE) Appendix 5.

National Committee of Inquiry into Higher Education, (1997b), *Higher Education in the Learning Society*, (London: NICHE).

Naughton, J., (1999), 'This is where it's @', *The Observer Review*, 22nd August 1999, p.3.

Nemirovski, G., Huel, E., Hirsekorn, H., Schlageter, G., (1998), 'Combining Online and Offline Learning within a Homogenous Environment', *Online Educa Conference Proceedings*, 4th International Conference on Technology Supported Learning, (Bonn: International Where and How).

Newby, H., (1999), 'Higher Education in the 21st Century: Some Possible Futures', *Perspectives*, Vol. 3, No. 4, 1999 p.106-113.

Newman, J.H., (1853), *The Idea of a University*, (NY: Doubleday).

Numminen, S., (1996), *National Innovation Systems: Pilot Case Study of the Knowledge Power of Finland*, (Paris: OECD).

OECD (1994), *Main Definitions and Conventions for the Measurement of Research and Experimental Development: A Summary of the Frascati Manual* OCDE/GD(94)84, (Paris: OECD).

OECD (1996), *The Knowledge-Based Economy*, (Paris: OECD).

OECD, (1998), *University Research in Transition*, (Paris: OECD).

OECD, (1999), *Science, Technology and Industry Scoreboard 1999: Benchmarking Knowledge Based Economies*, (Paris: OECD).

Olio, D., (1998), *From Traditional to Virtual: the New Information Technologies*, (UNESCO: mimeo).

Parjanen, L., (1997), *Open University in Finland*, (Ministry of Education: Helsinki), (trans by V. Mattila).

Paulsen, M., (1995a), 'Moderating educational computer conferences', in Berge, Z., & Collins, M., (eds.) *Computer mediated communication and the online classroom*, (Cresskill, NJ: Hampton Press).

Paulsen, M., (1995b), '*The Online Report on Pedagogical Techniques for Computer-Mediated Communications'*, [WWW document]. http://www.nettskolen.com/alle/forskning/19/cmcped.html

Peters, O., (2000), 'The Transformation of the University into and Institution of

effective use of educational technology, (London Routledge).

Leer, A., (1998), 'The Market for Educational Software and Multimedia', Discussion Paper for the OECD *National Expert Meeting on New Developments in Educational Software*, (Paris: mimeo), June 4-5.

Leiner, B., Cerf, V., Clark, D., Kahn, R., Kleinrock, L., Lynch, D., Postel, J., Roberts, L., Wolff, S., (1997), 'A Brief History of the Internet' *On The Internet*, [WWW document]. http://www.isoc.org/internet/history/brief.html.

Leinster-Mackay, D., (1978), 'The idea of a University: A historical perspective on some precepts and practices', *Vestes*, Vol. 20 No. 4, p.28-33.

Mäenpää, K., Luukikainen, S., (1994), *Telecommunications: Clustering, Diversity and Competitiveness*. (Helsinki: Taloustieto Oy).

Markkula, M., Suurla, R., (1998), *Passion to Learn: Benchmarking Good Lifelong Learning Practice*, IACEE Report No 9 (trans Eeva-Liisa Pitkanen) (Helsinki: Cosmoprint OY).

Martin, F., Trudeau, M., (1998), 'The Economic Impact of University Research', *Research File*, Vol. 2 No. 3, p.1-5.

Martin, F., and Trudeau, M., (1999), 'Measuring the Economic Impact of Universities: Canada' in Gray, H., (ed), *Universities and the Creation of Wealth*, (London: SRHE), p.47-65.

Mason, R., (1998), *Globalising Education: Trends and Applications*, (London: Routledge).

Mason, R., (1999), 'The Impact of Telecommunications', in Harry, K., (ed), *Higher Education Through Open and Distance Learning*, (London: Routledge) p.32-47.

Massachusetts Technology Collaborative, (1999), *Technology and Economic Growth: The Structure and Performance of Technology-Intensive Industries*, [http://www.mtpc.org/docs/rprtteg1.htm].

McCollum, K., (1997), 'A professor divides his class in two to test value of on-line instruction', *The Chronicle of Higher Education*, Vol. 43 No.24.

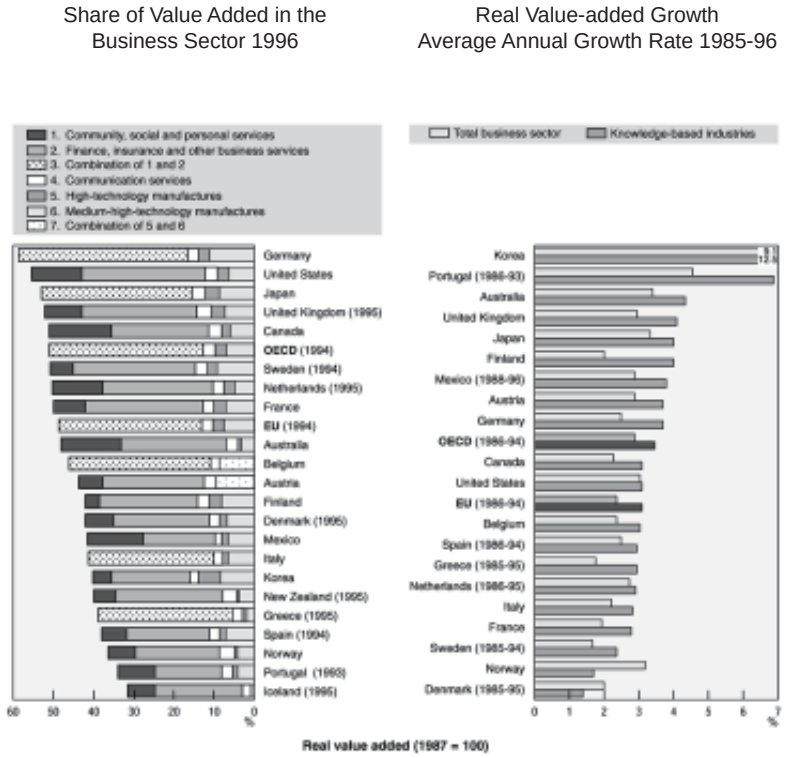
McCormack, C., Jones, D., (1998), *Building a Web Based Education System*, (New York: Wiley).

McIsaac, M., (1999), 'Distance Learning: The US Version', *Performance Improvement Quarterly*, Vol. 12, No. 2, p.21-35.

Meister, J., (1998), *Corporate Universities: Lessons in Building a World Class Workforce*, (NY: McGraw Hill).

National Committee of Inquiry into Higher Education, (1997a), 'Higher Education

Diagram 1: Knowledge Based Industries and Services



Source: OECD, *Science, Technology and Industry Scoreboard, 1999,* (OECD: Paris) p.19

In addition to the economic and financial and economic aspects of the growth in high tech industries, during the 1990's the growing information society has had a profound impact on the social and economic fabric of Finland, for example a study by Raivola and Vuorensyrja indicated a transformation was underway to:

- an inter-linked knowledge based economy and information society;
- an economy centred on information and knowledge management, through intelligent logistics and project organisation;
- an economy which both serves and is served by, a quality conscious and digitally oriented workforce.[91]

This transformation has manifested itself in various ways. As can be seen from the tables and diagrams below, Finland now has the highest number of Internet

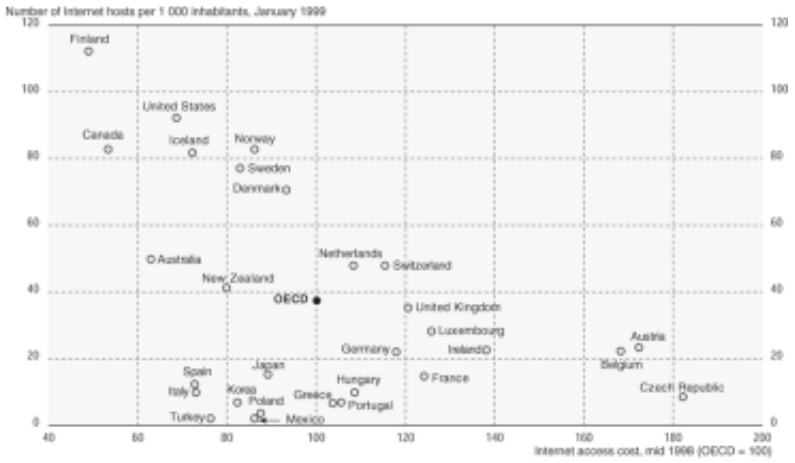
hosts per 1000, with the lowest cost of Internet access and the fastest growth in family ownership of personal computers – in 1990 only 8% of Finnish households owned a personal computer, by 1999 the figure was 42%.

Table 2: % of Households in Finland owning C&IT Equipment, March 1999

	%
Television	94
Wired Telephone	79
Mobile Phone	76
Microcomputer	42
Cable TV or satellite	37
CD-Rom Drive	31
Printer	30
Modem	23
Internet Connection	22

Source: Statistics Finland (1999)

Diagram 2: Internet Access Cost and Internet Host Density OECD Nations 1998-99



Source: OECD, *Science, Technology and Industry Scoreboard, 1999*, (OECD: Paris) p.19

Halsey, A.H., (1992), *Decline of Donnish Dominion: The British Academic Profession in the 20th Century*, (Oxford: Clarendon Press).

Harasim, L., (1993), 'Collaborating in cyberspace: Using computer conferences as a group learning environment', *Interactive Learning Environments*, Vol. 3, p.119-130.

Hardy, V, (1992), 'Introducing Computer-Mediated Communications into Participative Management Education: the Impact of the Tutor's Role', *Education and Training Technology International*, Vol. 29, No2, p.325-331.

Hawkridge, D, (1995), 'The Big Bang Theory in Distance Education' in Lockwood, F. (ed), *Open and Distance Learning Today*, (London: Routledge), p.3-12.

Heinonen, O., (1997), 'What are National Authorities Expecting from Higher Education Institutions?', *Higher Education Management*, Vol. 9 No. 2, p.7-17.

Henderson, R., Jaffe, A., Trajtenberg, M., (1998), 'Universities as a Source of Commercial Technology: A Detailed Analysis of University Patenting, 1965-1988', *Review of Economics and Statistics*, Vol.80, No.1, p.119-127.

High Level Group on the Information Society, (1994), *Europe and the Global Information Society* (The Bangemann Report) (Brussels: European Commission).

Humboldt, W., (1970), 'On the spirit and the organisational framework of intellectual institutions in Berlin', *Minerva*, Vol. 8, p.242-267 (original work published 1809).

Karran, T., and Pohjonen, J., (1999), 'Towards the Virtual C@mpus: Possibilities, Problems, and Practicalities', EADTU Conference, Milton Keynes, mimeo.

Kaukkonen, E., and Nieminen, M., (1999), 'Modeling the Triple Helix from a Small Country Perspective,' *Journal of Technology Transfer*, Vol 24, No.2&3, p.111-254.

Kaukonen, E., (1997), *The Evaluation of Scientific Research: Selected Experiences*, (Paris: OECD).

Keegan, D., and Rumble, G., (1982), 'The DTUs: an appraisal', in Rumble, G., and Harry, K., (Eds), *The Distance Teaching Universities*, (London: Croom Helm).

Kerr, E., (1986), 'Electronic Leadership: A Guide to Moderating Online Conferences', *IEEE Transactions on Professional Communications*, Vol. 29 No.1. p.12-18.

Langlois, C., (1997), 'Information Technologies and University Teaching, Learning and Research' in Hlavicka, J., & Kveton, K., (eds.), *Proceedings* of Rufis '97 Conference: The Role of the University in the Future Information Society, p.183-187.

Laurillard, D., (1993), *Rethinking University Teaching: A Framework for the*

Finnish Ministry of Education, (1998), White Paper *Higher Education Policy in Finland* (Helsinki: Finnish Ministry of Education).

Finnish Ministry of Education, (1999a), White Paper *Education, Training and Research in the Information Society: A National Strategy for 2000-2004* (Helsinki: Finnish Ministry of Education).

Finnish Ministry of Education, (1999b), *Education in Finland,* (Helsinki Ministry of Education).

Finnish Ministry of Finance (1998), *Benchmarking Finland: An Evaluation of Finland's Competitive Strengths and Weaknesses*, (Helsinki: Ministry of Finance).

Finnish Ministry of Finance (1999), *Economic Bulletin* 25th November 1999, (Helsinki: Ministry of Finance).

Finnish Ministry Of Labour (1999), *Finland's National Action Plan for Employment 1999* [http://www.mol.fi/tpts/nape_part0.html].

Finnish Ministry of Trade and Industry, (1999), *White Paper on Industrial Policy (*Helsinki: Ministry of Trade and Industry) mimeo.

Florida, R.,(1995), 'Towards the Learning Region', *Futures*, Vol. 27, No5, p.527-536.

Gladieux, L., and Swail, W., (1999), *The Virtual University and Educational Opportunity*, (Washington: The College Board).

Goddard, J., (1997), *Universities and Regional Development: An Overview*, OECD Project in the Response of Higher Education to regional needs, (Paris: OECD)

Goddard, J., Charles, D., Pike, A., Potts, G., Bradley, D., (1994), *Universities and Communities*, (London: CVCP).

Grandgenett, N, Grandgenett, D, Topp, N, Fluckinger, J, Ostler, E, Mortensen, R., (1997), 'Integrating Technology into Teaching and Learning: Three Keys to the Kingdom' *Innovations in Education and Training International*, Vol. 34, No. 4, p.252-256.

Gubernick, L., and Ebeling, A., (1997), 'I got my degree via email' *Forbes On-Line*, [WWW document]. http://www.forbes.com/forbes/97/0616/5912084a.htm

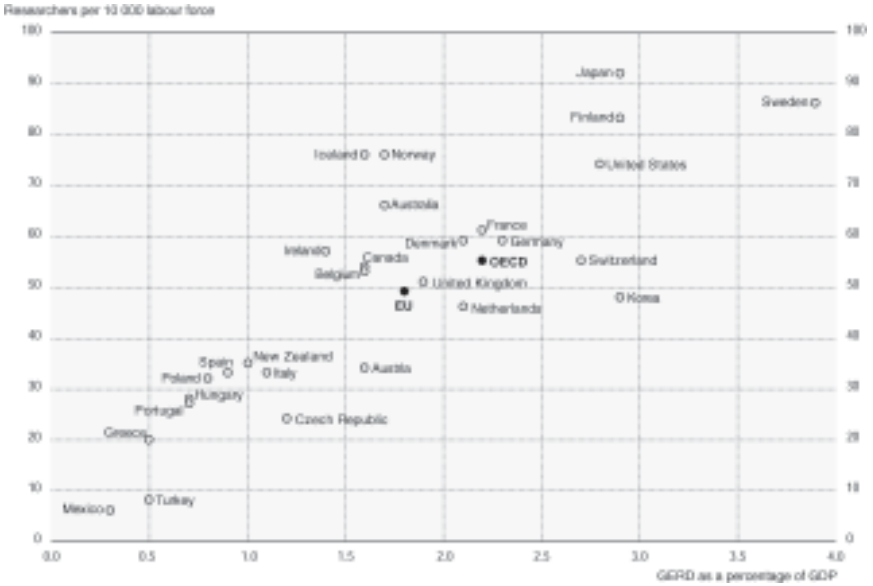
Haapakorpi, A., (1995), 'The Recession in Finland and the Labour Market for Academic Degree Holders', *European Journal of Education*, Vol.30, No.1, p.105-110.

Hall, J., (1996), 'Electronic Technology and the Modern University' in Evans, T., and Nation, D., (eds), *The Opening Education: Policies and Practices from Open and Distance Education*, (London: Routledge) p.7-20.

The need to address the challenges of such transformations lead to the Finnish government to develop an information society strategy with two inter-related aims. First, to develop and capitalise on opportunities arising from areas of national strength within the information society. Second, to identify and address the challenges and threats that the Information Society may impose.[92] This strategy integrates all aspects of national policy – for example the *White Paper on Industrial Policy* states that "Industrial policy measures are of particular importance in the development of knowledge-based services. These measures should focus on improving the efficiency and competitiveness of these services. Of the key industrial policy areas, particularly education, technology policies and financial aid should be more closely tailored to the service sector's special requirements. Knowledge-based services are mainly directed to enterprises and their export markets cover the whole world. They contribute to the efficiency and productivity of the economy by promoting specialised production and administrative processes and by enhancing industrial productivity. The employment effects of developing knowledge-based services appear in the medium or long term in the form of new permanent and well-paid jobs."[93] Similarly Finland's *National Action Plan for Employment* states that: "We need a technology policy that can help Finland retain its position in the vanguard of technological development. Research and development operations must be stimulated even in the less developed regions of the country. We need to improve the general level of expertise. Finland is being transformed into an information society where information and expertise are the key production factors. We need an education and training policy based on the needs of the labour market and the principle of lifelong learning. Equal educational and training opportunities according to the principle of lifelong learning are the right of every citizen regardless of place of residence, age, sex, language and economic position."[94]

A major element of this strategy is a high level of Research and Development spending, which stems from the "widespread consensus among Finland's political parties, and within the private sector, that the economic future and social well-being of the country can only rest on a strong foundation of education, high-quality research and know-how."[95] OECD data, shown in diagram 3, reveals that R&D expenditure as a proportion of GDP fell in the 1990s for most EU nations, but Finland is a notable exception to this trend, and is now among the top four OECD nations in respect of funding allocated to R&D and the number of researchers in the workforce.

Diagram 3: GDE on R&D as a % of GDP and researchers per 10,000 of the labour force 1997



Source: OECD, *Science, Technology and Industry Scoreboard, 1999* (OECD: Paris) p.29

Commenting on these trends, Pulkkinen notes "Finland now ranks fourth among EU countries in terms of the ratio of research spending to GDP. By increasing public R&D expenditure to 2.9 per cent Finland ensures that by the end of the century it will be among the leading countries in terms of GDP share of R&D expenditure. … The future of the economy, employment, and intellectual and material well-being depends heavily on a strong yet flexible system of innovation."[96] Within this overall trend for increased government funding for university research, there has also been a narrowing of focus so as "to guarantee the pre-requisites for basic research and lay the foundations for a strong, internationally top-level research environment. The universities are expected to concentrate their research activities on their special fields of interest."[97] To this end, Centres of Excellence have been set up as "a strategic means for promoting the internationalisation of the Finnish science system … (and) ... as a means of strengthening political and public confidence in science."[98] This trend is not unique to Finland - work by the OECD revealed that "the current trend towards concentrating research in fewer institutions, coupled with the increasingly

Chronicle of Higher Education, (2000), 'Enrollment Growth Remains Slow at Western Governors University', 14th January.

Clark, R., (1984), 'Research on Student Thought Processes During Computer-based Instruction', *Journal of Instructional Development*, Vol.7, No.3, p.2-5.

Collis, B., (1999), 'Telematics-Supported Education for Traditional Universities in Europe', *Performance Improvement Quarterly*, Vol.12 No.2, p.36-65.

Crystal, D., (1999),'The Death of Language', *Prospect*, November, p.56-59.

Dahllöf, U., Goddard, J., Huttunen, J., O'Brian, C., Román, O., Virtanen, I., (1998), *Towards the Responsive University: The Regional Role of Eastern Finland Universities*, (Helsinki: Edita).

Daniel, Sir J., (1997), Speech delivered at the American Association of Higher Education, National Conference on Higher Education, 'Learning, Technology, and the Way We Work.' Washington DC March 16-19.

Daniel, Sir J, (1998), *AAHE Bulletin*, Vol.50, No.9, p.11.

Daniel, Sir J, (1999), Speech delivered in TARA, Nova Scotia, Canada 12th April.

de Gaudemar, J., (1997), 'The Higher Education Institution as a Regional Factor', *Higher Education Management*, Vol.9 No.2, p.53-64.

Dias, M., (1994), 'New Trends in Interuniversity Co-operation at Global Level', *Higher Education Managemen*t, Vol. 6 No 1, p.104-114.

Dolence, M., Norris, D., (1995), *Transforming Higher Education: A Vision for Learning in the 21st Century*, (Ann Arbor: Society for College and University Planning).

Drew, R., Dew, P., Morris, D., Leigh, C., & Curson, J., (1996), 'The Virtual Science Park', *British Telecommunications Engineering*, Vol.1, No 4, p.322-329.

European Commission (1995), *Teaching and Learning: Towards the Learning Society*, White Paper on Education and Training, (Brussels: E.U).

European Commission, (1999), http://www.echo.lu/ist/ka3/intro.html [WWW document].

European Ministers of Education (1999), *The European Higher Education Area*, (Bologna: mimeo).

Evans, T., and Nation, D., (1996), 'Opening Education: Global lines, local connections' in Evans, T., and Nation, D., (eds), *The Opening Education: Policies and Practices from Open and Distance Education*, (London: Routledge) p.1-6.

Farrell, G., (1999), *The Development of Virtual Education: A Global Perspective* (Vancouver: The Commonwealth of Learning).

Bibliography

Abeles, T., (1998), 'The Academy in a Wired World', *Futures*, Vol.30, No.7, p.603-613.

Ahola, E., (1995), 'Review of empirical knowledge and an assessment of statistical data on the economic importance of new, technology-based firms (NTBFs) in Finland. Task 5: NTBFs public policy in Finland'. A draft report prepared for the European Innovation Management System (EIMS), November 15, 1995.

Association of Graduate Recruiters, (1995), *Skills for Graduates in the 21st Century*, (Cambridge: A.G.R.).

Balazs, K., (1996), 'Academic Entrepreneurs and their Role in Knowledge Transfer', *STEEP Discussion Paper No 37*, (Brighton, University of Sussex) mimeo.

Bjarnason, S., Davies, J., Farrington, D., Filden, J., Garrett, R., Lund, H., Middlehurst, R., Schofield, A., (2000), *The Business of Borderless Education: UK perspectives: Summary Report*, (London: CVCP)

Bates, A., (1995), *Technology, Open Learning and Distance Education*, (London: Routledge).

Berg, G., (1998), 'Public Policy on Distance Learning in Higher Education: California State and Western Governors Association Initiatives', *Education Policy Analysis Archives*, Vol. 6. No. 11.

Bligh, D., (1995), 'International Education: Australia's Potential Demand and Supply', (mimeo) paper presented to the 1995 *International Education Conference*, Brisbane, October 1995.

Botkin, J., Elmandjra, M., Malitza, M.,(1979), *No Limits to Learning: Bridging the Human Gap*, (Oxford: Pergamon).

Brittain, M., Chamber, M., Marriott, P., (1997), 'Design Considerations in the development and delivery of digital learning media', (mimeo) paper presented at the *ED-Media Conference*, Frieburg , Germany.

Buchbinder, H., (1993), 'The market oriented university and the changing role of knowledge', *Higher Education*, Vol.26, p.331-347.

Bush, Vannevar, (1945), *Science The Endless Frontier,* A Report to the President by Vannevar Bush, Director of the Office of Scientific Research and Development, July 1945 (United States Government Printing Office: Washington).

Chambers, M., (1999), 'The efficacy and ethics of using digital multimedia for educational purposes', in Tait, A., and Mills, R., (eds) *The Convergence of Distance and Conventional Education*, (London: Routledge) p.5-16.

important teaching and training roles of higher education systems as a whole, is creating noticeable institutional tensions."[99] This concentration of research within a smaller number of centres of excellence helps to achieve critical mass but, to ensure that the impact of research is maximised throughout the economy, will also require strong dissemination processes.

However, in his study of the innovation system in Finland, Numminen found that "R&D cooperation with universities is largely concentrated among large firms" and that "the fact that funding by Finnish firms accounts for only some 5% of all research activities within the higher education system, seems to point to the conclusion that the level of industry-university cooperation is very low indeed" leading him to conclude that "although there has been a marked increase in the various forms of university-industry innovation in recent years, the effectiveness of the use of the university knowledge base by the industry continues to be a major concern."[100]

The Impact of Science Parks and Technology Transfer.

A crucial aspect of the innovation process and technology transfer between universities and business in Finland has been the very successful role of Science Parks and Technology Transfer Companies. As table 3 shows there are now circa 800 firms located in Science Parks, and Pulkkinen reports that the annual growth rate in the number of employees in Science Parks has been 20-30% during the last five years.[101] Science parks have increased both in number, and in the fields of technology they encompass, such that most major Finnish industries are now represented by firms on science parks, often working in collaboration with a local university. As table 4 shows, universities have established more formal ways of commercialising their research through technology transfer companies. Typically such companies offer four types of services: licensing of research results; services for the commercialising of research results and products developed in universities; management assistance for new business start-ups and research projects; co-ordination of monitoring activities for new product ideas.[102]

Table 3: Science Parks in Finland in 1995

Science park	Firms	Employees	Adjoining city population
Oulu (Teknopolis, Medipolis)	250	1500	100 000
Espoo	200	1 500	200 000
Turku (DataCity, ElectroCity, BioCity)	100	2 000	160 000
Tampere (Hermia)	150	1 500	180 000
Lappeenranta (Kareltek)	50	500	55 000
Kuopio (Teknia)	50	500	85 000
Jyväskylä	50	1 000	72 000
Joensuu	20	100	50 000
(Helsinki)	-	-	500 000

Source: Ahola, E., (1995) *Review of empirical knowledge and an assessment of statistical data on the economic importance of new, technology-based firms (NTBFs) in Finland*

Table 4: Technology transfer companies in 1995

Firm (city and the year of establishment)	Owners
Aboatech Oy (Turku, 1993)	SITRA, and the foundations of the University ofTurku and ÅboAkademi
HU Licencing Oy (Helsinki, 1993).	Helsinki University Holding Oy and SITRA
Finntech Oy (Espoo, Otaniemi, (1984 Otatech), 1993)	VTT, Helsinki University of Technology, SITRA
Oulutech Oy (Oulu, 1994)	SITRA, the foundation of the University of Oulu and the Science Park of Oulu
Tamlink Oy (Tampere, 1986)	SITRA, Tampere University of Technology, Foundation of the University of Technology, City of Tampere and KERA

Source: Ahola, E., (1995) *Review of empirical knowledge and an assessment of statistical data on the economic importance of new, technology-based firms (NTBFs) in Finland*

STAGE 4 National Policy Evaluation	European and National Government Agencies (Ministries)	Regional/Local Government Agencies	National and Regional Business Consortia	National and Regional ICT Providers (Television, radio, phones, publishers)	University, Open University and Polytechnic Sectors	Academic Staff Associations and Trade Unions	Professional Associations	General Public
Evaluate impact of NVU on Information Society and Knowledge Economy Policy Strategies	Provide macro level data on costs and benefits and impact of NVU on Information Society Objectives (educational access policies, equality of opportunity, national skills levels and technological transfer and development) within national and European framework	Provide micro level data on costs and benefits and impact of NVU on Regional/ Local Objectives (educational access policies, equality of opportunity, national skills levels and technological transfer and development) within national and regional/local framework Provide micro level	data on costs and benefits and impact of NVU on National/ Regional Business Objectives (improved productivity, higher skills levels greater use of technological transfer and development) within national and regional/local framework Provide micro level	data on costs and benefits and impact of NVU on National/ Regional Use of ICT (improved ICT awareness and skills, greater usage of ICT in the workplace and at home, greater transfer of ICT skills in to other areas of life) within national and regional/local framework Provide institutional	and sectoral data on costs and benefits and impact of NVU on teaching and research functions (increased student numbers, improved ICT awareness and skills, greater usage of ICT in teaching, increased research activities and collaboration) within national and regional/local framework	Provide sectoral data on costs and benefits and impact of NVU on teaching and research functions (increased workloads, needs for staff development to provide new skills sets, altered academic roles, alterations in job satisfaction, changes in recruitment to the profession) within national and regional/local framework	Provide data on costs and benefits and impact of NVU within specific professions (changes in numbers entering professions, alterations in professional accreditation, changes to the nature of professional roles and responsibilities) within national and regional/local framework	Data gathered via opinion polls and government household and social surveys
Exercise strategic foresight and redefine European and National Information Society Objectives and Policy Options	Discussion at National Government level of impact of NVU on previous and new national and global policy objectives and options	Regional discussions input to national level and European Level via the Council of the Regions	National/ Regional discussions, input to national debate via business organisations and links with national government and parties	National/ Regional discussions, input to national debate via business organisations and links with national government and parties	Institutional, regional and sector wide debate, academic analysis of impact of NVU and new policy options at regional and national level	Sector wide debate, analysis of impact of NVU and new policy options and contributions to policy making at regional and national level	Regional/National debates and discussions via professional conferences, journal articles, etc of impact of NVU and new policy options	Bring results into the national arena via ministerial press releases, newspaper coverage of government policy.

STAGE 3f Regional/Local Design and Development Projects	National funding Council for higher education	Regional/Local Government Agencies	National and Regional Business Consortia	Academic administration (departmental, institutional or national)	Resource administration (departmental, institutional or national)	Courseware development team (Inter- or intra-institutional)	Discipline area (Departmental, institutional, or national)	Individual academic lecturer
Commencement of virtual science park and technology transfer functions	Promote involvement of universities and companies at national level	Promote involvement of universities and companies at local level	Promote involvement of companies at local level	Promote involvement of university departments	Manage marketing, distribution of course materials		Promote involvement of university departmental staff	
Integration with existing research activities	Establish local and national fora for research collaboration and collate results	Establish local fora for research collaboration	Review of existing research activities to see how they might be modified	Coordinate institutional input in to discussion on research collaboration			Set up a forum for research collaboration	Review of existing research activities to see how they might be modified
Academics and other users briefing	Provide national guidelines for academics and businesses on research and technology transfer	Disseminate national and local guidelines to academics and businesses on research and technology transfer	Disseminate national and local guidelines to businesses on research and technology transfer	Disseminate national and local guidelines to academic departments on research and technology transfer			Disseminate national and local guidelines to academic staff on research and technology transfer	Review progress on current collaborative research
Evaluation of effectiveness of virtual science park and technology transfer functions	Establish and Implement local and national evaluation procedures.	Implement local and national evaluation procedures.	Provide materials to aid evaluation Monitor companies use of virtual science park and level of research collaboration	Provide materials to aid evaluation of academic use of virtual science park and level of research collaboration			Collate data on academics use of virtual science park and level of research collaboration	Provide data on individual use of virtual science park and level of research collaboration
Document impact on technology transfer	Collate results and disseminate results via national and local fora	Receive and distribute results to local communities	Receive and distribute results to companies	Receive and distribute results to academic departments			Receive and act on published reports	Report on lessons learned

Summary

Although this over-view is necessarily partial, nevertheless it identifies particular trends and facets within Finnish society, which a development like a virtual university should help to address. The information society is arriving in Finland (both in the home and at work) at an acceleratory rate, which is considerably faster than that elsewhere in the OECD. The effects of policies which further increase the use and impact of communications and information technology, yet also attempt to improve equality of opportunity, will be felt across all aspects of business and personal life.

A national virtual university will provide a useful and flexible policy instrument to:

- *Ensure adequate IT training for all people, in a working environment in which ITC competence is viewed as an essential entry skill;*
- *Reduce inequalities in access to higher education caused by differences in age, sex, ethnic background, social class and geographical location;*
- *Allow training to take place at home and at work, as required by the learner, and through a variety of different and complementary media;*
- *Enable the widespread dissemination of research results from a small number of research centres of excellence;*
- *Promote technology transfer from universities to industry to bring fresh and original ideas on-stream in the form of new products, processes and services to market quickly;*
- *Enhance, extend and develop the current links which exist between universities and businesses through Science and Business Parks.*

The Higher Education Network

The most critical factor for any government seeking to use new technologies to promote access to higher education by means of virtual campuses and similar developments is the existing configuration of universities, open universities and distance education provision. Moreover, “institutions of higher education mirror the culture and the socio-economic structure of their private or public (national/governmental) sponsors in the way they are organised and in the content of their curriculum.”[103] The current h.e. structure constitutes the foundation on which virtual campus developments will be built, as completely re-configuring higher education to take account of telematic innovation in curriculum delivery would be politically impossible and financially costly. The extent to which open universities will lead the drive towards virtual education delivery is also contingent upon the preferred strategy of central government, which may wish limit such developments to specific institutions, or allow all higher education institutions to develop their own individual virtual university projects, or encourage collaboration to build a national system.[104] Determining which matrix of distance provision

and national policy is more likely to possesses the strategic foresight to deliver the Information Society most successfully is clearly problematic but of obvious importance, given that the speed of development of new technologies means that an opportunity, once lost, is increasingly difficult to retrieve.

Hence the tactics adopted by individual universities to utilise new technologies in learning, must bolster rather than contradict strategies implemented by governments at national level. Furthermore, the policy adopted at local and regional level will be crucial in determining both how successfully individual countries respond to the economic and social pressures of the developing global knowledge economy, and whether they manage to advance national prosperity by using new technologies. Consequently, national strategies will define the policy arenas within which universities will operate, as they contemplate how to realise aspirations for a virtual campus. In Finland a specific strategy group has been designated within the Ministry of Education to consider the building of a National Virtual University, while in most other European nations no such similar strategy group has been established at state level. Furthermore in Finland it is intended that "A multidisciplinary virtual university will be established to produce and transmit high-quality educational services and enable network-oriented research. The network will include services offered by the virtual open university"[105] and "a national network service will be implemented to support teaching and learning through developing the existing services" which will "provide all users of educational services access to the public educational services in the network through a single interface."[106]

Universities

University education in Finland has a distinguished lineage, which started with the establishment of Turku Academy in 1640, but then growth was slow - by 1960 there were 10 universities. However, the 1960's saw the number double and currently there are ten multi-disciplinary institutions, six specialist institutions and four art academies. By 1998 the 20 universities had a total of 147,300 f.t. university students, making up 29.4% of all school leavers, and employing 11,500 teaching and research staff, with over 14,000 other staff. The 1997 Universities Act defines the purpose of Universities in Finland as to:

> "promote independent research and scientific and artistic education, to provide instruction of the highest level based in research, and to raise the young to serve the fatherland and humankind. Universities shall arrange their operations in order for research, education and instruction achieve high international standards, by observing ethical principles and good scientific practice" [107]

STAGE 3e Regional/Local Design and Development Projects	National funding Council for higher education	Regional/Local Government Agencies	National and Regional Business Consortia	Academic administration (departmental, institutional or national)	Resource administration (departmental, institutional or national)	Courseware development team (Inter- or intra-institutional)	Discipline area (Departmental, institutional, or national)	Individual academic lecturer
Introduce National IT Course Delivery and CMC Platform	Assess effectiveness of IT course delivery and CMC platform against national and local plans and needs. Institute service level agreements and problem reporting structures	Assess effectiveness of IT course delivery and CMC platform against national and local plans and needs. Report problems and staff development needs	Assess effectiveness of IT course delivery and CMC platform against national and local plans and needs. Report problems and staff development needs	Assess effectiveness of IT course delivery and CMC platform against national and local plans and needs. Report problems and staff development needs	Assess effectiveness of IT course delivery and CMC platform against national and local plans and needs. Report problems and staff development needs	Assess effectiveness of IT course delivery and CMC platform, and report problems and staff development needs	Assess effectiveness of IT course delivery and CMC platform, at subject level and report problems and staff development needs	Assess effectiveness of IT delivery platform in courseware delivery, at individual level and report problems and staff development needs
Dissemination of course ware	Promote involvement of publishers at national level	Promote involvement of publishers at local level	Promote involvement of publishers at local level	Promote involvement of publishers at local level	Manage marketing, distribution of course materials			
Students and other users briefing	Provide national guidelines for teachers and students advice on the use of courseware	Disseminate national and local guidelines for teachers and students advice on the use of courseware	Disseminate national and local guidelines for trainers and students advice on the use of courseware			Provide teachers and students guide to the use of courseware	Provide teachers and students guide to the use of courseware. Review material and provide links to rest of course	Review material and provide links to rest of course
Student support and debriefing	Collate local and national data on need for additional support			Collate institutional data on need for additional support		Use teacher's guide to suggest additional support	Plan provision of additional support	Plan provision of additional support
Integration with existing course	Establish local and national fora for cross course collaboration and collate results			Coordinate institutional input in to discussion on cross course collaboration		Set up a forum for cross course collaboration	Set up a forum for cross subject collaboration	Review of the teaching to see how it might be modified
Evaluation of pedagogical effectiveness of teaching materials and support mechanisms	Implement local and national evaluation procedures.		Provide materials to aid evaluation Monitor students use of courseware in corporate settings	Provide materials to aid evaluation of academic support mechanisms	Provide materials to aid evaluation of resource management support mechanisms	Provide materials to aid evaluation Monitor students use of courseware and support mechanisms	Monitor students use of courseware Analyse assignments Change format of briefings, de-briefing, support as necessary	Monitor students use of courseware Analyse assignments Change format of briefings, de-briefing, support as necessary
Document pedagogical lessons learnt	Collate results and disseminate results via national and local fora	Receive and distribute results to local communities	Receive and distribute results to companies	Receive and distribute results to academic departments	Receive and distribute results to service departments	Receive and act on the reports	Receive and published reports	Report on lessons learned

STAGE 3d Regional/Local Design and Development Projects	National funding Council for higher education	Regional/Local Government Agencies	National and Regional Business Consortia	Academic administration (departmental, institutional or national)	Resource administration (departmental, institutional or national)	Courseware development team (Inter- or intra-institutional)	Discipline area (Departmental, institutional, or national)	Individual academic lecturer
Staff development for research and technology transfer functions	Review policy on local economic development and technology transfer. Provide funding for staff development. Ensure sharing of best local practice at national level	Set up staff development programme Promote use of materials developed elsewhere	Set up staff development programme Promote use of materials developed elsewhere	Set up staff development programme Promote use of materials developed elsewhere	Identify staff development needs for additional research and technology transfer activities		Identify individual staff development needs for additional research and technology transfer activities	
Staff development for administration and support functions	Provide funding for staff development. Ensure sharing of best local practice at national level	Set up staff development programme	Set up staff development programme	Set up staff development programme for on-line academic management functions	Set up staff development programme for on-line resource management functions		Identify individual staff development needs for additional research and technology transfer activities	
Staff Scheduling				Manage administration of teaching, research and staff development	Assess software needs for trac		Set up a forum for teachers to discuss ideas and experience	Input to forum for teachers to discuss ideas and experience
Student assessment standards	Review national policy on academic standards and student assessment modes and standards		Ensure compliance between corporate and academic assessment modes and standards and with national benchmarks	Collate institutional standards to ensure institutional and national compliance	Assess software needs for marking and tracking student assessments		Decide on changes to assessment requirements Communicate new requirements to students and academic staff	Incorporate assessment changes
Evaluation of Implementation	Review progress against national and local plans and targets	Review progress against national and local plans and targets	Review progress against national and local plans and targets	Review progress against national and local plans and targets	Review progress against local plans and institutional targets		Provide staff time to monitor implementation	
Document the logistical lessons learned	Revise national implementation plans and local plans and targets	Use reports to revise implementation plans and policy on the use of new technologies in teaching and research	Use reports to revise implementation plans and policy on the use of new technologies in teaching and research	Assign committee to received and act on the evaluation reports	Monitor logistics of implementation	Disseminate the lessons learnt and agree changes to targets and activities	Disseminate the lessons learnt and agree changes to targets and activities	

The university system has been reconfigured in the last decade by:

- Replacing the multi-disciplinary masters degree programmes with subject based syllabi usually operating through a major and minor degree matrix and leading to a bachelor's degree;
- Ensuring comparability with other international higher education curricula;
- Improving credit transfer between institutions to enable student choice and mobility;
- Focusing higher education more directly on labour market requirements by resourcing courses in hi-tech subjects (I.T., electrical engineering, electronics, telecommunications, etc.);
- Increasing evaluation of university activities with performance based funding, against targets and objectives agreed by individual universities with the Ministry of Education.

These reforms have made Finnish higher education more flexible and responsive to the needs of students and industry. From an international perspective there are various aspects of the system which are worthy of note:

Subject Choice - Most Finnish universities offer joint subject degree courses based on a major/minor configuration, with the minor subject sometimes available from another subject field or even faculty. However, these degree schemes would not be considered as "modular" in the British or American sense, and hence lack the high level of flexibility and student choice associated with such programs.[108] Additionally there is little sign of enabling learners to design their own curricula, through (for example) Learning Contracts.

Accreditation - There appears to be little attempt to facilitate entry through the use of APL (Accreditation of Prior Certificated Learning) or AP(E)L, (Accreditation of Prior Experiential Learning) as has been used in, inter alia, the U.K. to promote entry by mature students and/or disadvantaged groups.

Free Tuition - The Finnish system does not levy tuition fees on students, which is now probably exceptional among modern Western nations. Currently the maximum support available for completing a Master's degree covers 55 months and includes a study grant, housing support and a State guaranteed loan. Clearly, this is an integral part of the national policy of equality of opportunity of access to higher education, irrespective of income or geographical location. It may be difficult to continue with this policy unless more cost effective ways are utilised for learning (e.g. via the use of new technologies and the virtual university), or cross-subsidisation of home students is made possible by selling higher education to external markets by use of the WWW.

Long Completion Times - The average age for completion of Master's degrees in Finland is 27, and the median age at which students complete their doctorates

is 37.[109] This is longer than in most European countries and has been examined by, inter alia, the OECD. These delayed graduations have various impacts including:

- Increased burdens on universities, in terms of teaching, (classes may be larger), and administration (ensuring accurate tracking of, and maintaining data on students for long periods), as well as the opportunity cost (less time for research) and the problem of long term resource planning when the speed of degree completion by students cannot be forecast;
- Increased burdens on public expenditure through longer periods of government support for students;
- Reduced productive working lives for students, as delayed entry into employment reduces the productive career of graduates, especially at Ph.D. level;
- Redundant qualifications, as much of the knowledge a graduate possesses may be out of date, when completion takes so long;
- Increased labour shortages as delayed entry into employment may create shortages of skilled labour, which both restrict economic growth and can produce wage inflation.

Collaboration with Training Providers and Industry - Finnish universities collaborate with industries in research, but seem less innovative in collaboration through (for example) accrediting and franchising courses run by other training providers, or the development of Work Based Learning Degrees, in which professional activities undertaken at work are assessed to see whether, and to what extent, they deliver the same learning outcomes as university courses.

Life Long "Learning to Learn" Skills - The Dearing Committee of Inquiry into Higher Education in the UK Report in 1997 emphasised the need for four key skills, which all graduates need whatever they intend to do in later life, namely:

- communication skills;
- numeracy;
- the use of information technology;
- learning how to learn.[110]

This point is alluded to in Sinko and Lehtinen's study in which they state "the application of ICT can enrich traditional university education and narrow the gulf between traditional academic studies and the changing demands of working life. With innovative use of technology, universities can train their students in the key skills called for in modern working life, such as teamwork, networking, internationalization, project management, communication, solving complex problems without compromising on their basic task of academic education."[111] Additionally Haapokorpi has described the way in which the recession in Finland in the early '90s sharpened competition in the labour market and forced universities

STAGE 3c Regional/Local Design and Development Projects	National funding Council for higher education	Regional/Local Government Agencies	National and Regional Business Consortia	Academic administration (departmental, institutional or national)	Resource administration (departmental, institutional or national)	Courseware development team (Inter- or intra-institutional)	Discipline area (Departmental, institutional, or national)	Individual academic lecturer
Test Administrative Support Mechanisms	Ensure local system meets national requirements	Ensure local system meets requirements e.g. career and employment advice services and public service support features and cmc needs	Ensure local system meets requirements e.g. for vocational guidance, continuous professional upadating, and research and tecnology transfer and cmc needs	Ensure local system meets requirements e.g. for student support, electronic library facilities, on-line course assessment, and cmc needs	Ensure local system meets requirements e.g. for course registration, student tracking, on-line payments, and cmc needs			
Plans resourcing and scheduling	Monitor local project management against local and national plans	Monitor project management against local and national plans	Monitor project management against local and national plans	Monitor project management against local and national plans	Agree development resources	Carry out developmental testing and piloting of courseware Report on efficiency of procedure to monitoring committee	Agree staff and student time commitment	
Administration of hardware, software materials	Promote bulk purchasing of hardware and course ware Promote transfer of course ware across institutions	Provide support staff for maintenance and administration	Provide support staff for maintenance and administration	Provide support staff for maintenance and				
Staff development for teaching and learning	Review policy on appraisal and quality assurance. Provide funding for staff development. Ensure sharing of best local practice at national level	Set up staff development programme Promote use of materials developed elsewhere	Set up staff development programme Promote use of materials developed elsewhere	Set up staff development programme Promote use of materials developed elsewhere Determine changes to appraisal and promotion procedures		Identify staff development needs for use of all new courseware	Identify departmental staff development needs for use of subject based courseware	Identify individual staff development needs for use of subject based courseware

STAGE 3b Regional/Local Design and Development Projects	National funding Council for higher education	Regional/Local Government Agencies	National and Regional Business Consortia	Academic administration (departmental, institutional or national)	Resource administration (departmental, institutional or national)	Courseware development team (Inter- or intra-institutional)	Discipline area (Departmental, institutional, or national)	Individual academic lecturer
Address students' needs at undergraduate and post graduate level	Utilise higher education statistics on course demand		Audit need for work based learning	Collate and analyse student feedback on course quality and delivery	Provide analysis of student recruitment and drop out rates	Provide analysis of exam scripts, teacher's experience elicit student's perceived problems	Provide assessment of demand for existing subjects and inter-disciplinary courses	
Determine key areas of the curriculum and research project functions for the Region	Promote consortia to design transferable courseware Establish links with schools and training organisations	Facilitate project management, monitoring and evaluation	Identify joint areas for industry/h.e. collaboration in both teaching and research	Identify institutional staff teams in chosen subject/functional areas	Estimate resource implications of freeing staff and resources for local/regional project	Analyse course material at other universities in national and international arenas	Convene forum of teachers to identify key areas for development of learning materials and shared research	Input into discussions at institutional and within subject peer group
Build on what is known and benchmark best practice	Provide for maintenance of national database Promote funding of subject research and to improve learning Provide funding for evaluation of mediation multimedia	Provide local data on successful research collaboration through science parks and technology transfer.	Provide advice on best practice for commercial/ industrial/ professional training	Provide advice on best practice for research activities, technology transfer and university teaching	Promote access to national database Provide funding for journals and travel	Access to national database of courseware, reviews Literature search in key journals Attend key conferences	Identify appropriate subject specific pedagogy for telematic delivery, and research expertise for virtual science park	Join university and national networks for virtual learning and research
Use an explicit teaching design methodology	Establish design standards Establish copyright policy	Start to consider common software platform and hardware needs	Conduct audit of existing hardware provision and software platforms	Conduct audit of existing hardware provision and software platforms	Administer refereeing process for designer of course ware	Address critical aspects of the learning process Make effective use of the media Address design standards Consider IPR issues	Set up forum for discussion of the academic standards	
Institute efficient production procedures	Promote bulk purchasing of productivity tools Promote use of national and local networks	Use productivity tools, and communication networks during development	Use productivity tools, and communication networks during development		Provide funding and support for productivity tools	Use productivity tools, and communication networks during development		
Test IT System Features	Ensure local system meets national requirements	Ensure local system meets requirements of local learning community	Ensure local system meets requirements of business community	Ensure local system meets requirements of academic delivery systems	Ensure local system meets requirements of academic management systems	Ensure local system meets requirements of academic courseware		

to address the problems of the transition from higher education to working life in which "personal competences and skills play an increasingly important role in job recruitment."[112]

Polytechnics

Since the 1970's, growth in tertiary education has been met by the universities, with the setting up of the Polytechnics adsorbing some of the increased demand for degree level education. The Polytechnic system was established in the 1990's as a non-university sector in higher education and comprises a nationwide network of regional institutions of higher education, which was built up from the previous system of post-secondary vocational education. In contrast to the universities, the major objective of studying at a Polytechnics is to:

> "provide the necessary knowledge and skills for operating in occupational expert functions on the basis of the requirements set by working life and the development thereof"[113]

The general objectives of polytechnics are to:

- raise the standard of education;
- react to changing needs for expertise and skills;
- make vocational education more attractive;
- improve the international compatibility of vocational education;
- make the vocational education system more functional;
- decentralize the administration of vocational education;
- reinforce the regional impact of vocational education.

Since 1991, 20 permanent and 10 temporary Polytechnics have been established, and when the Polytechnic sector is fully operational it will provide places for about 100,000 students. It is difficult to assess the impact of the Polytechnic sector in Finland, given that it is still not fully implemented, however their development at this time is very interesting. In contrast to Finland, other countries which had experimented with Polytechnics since the 1950's, spent the 1990's dismantling the divide between the two institutions and making all higher education providers "universities", so in the UK, Australia and more recently New Zealand, the binary split was removed. However this convergence may be unusual - a cross-European appraisal reveals that maintaining the distinction between university provision and degree level vocational training is still the norm (as between the universities and the Fachhochschulen in Germany). A study of British polytechnics[114] revealed that they had often been of crucial importance in curricula innovations, and were instrumental in bringing in new ways of teaching and learning - so for example, modular degree schemes were pioneered by the Polytechnics, and quality monitoring was handled by a central body called the CNNA. Both these ideas have now moved into mainstream higher education policy in the UK.

An analysis of higher education in Eastern Finland, indicated that "the polytechnics will provide real challenges to the universities."[115] This analysis also highlighted the facts that:

- polytechnics are owned by municipalities, who also make the final decision over their level of funding;
- the administrative boards of the polytechnics consist of local and regional politicians who are more likely to commit the institution to regional objectives;
- budget funding of universities is based of performance criteria, while the funding of polytechnics is based on enrolment figures.

This growth of polytechnics in Finland is an interesting development, and from an international perspective, various aspects of the system are worthy of note:

Changing Status - in most nations Polytechnics have started off as "poor relations" of universities, and were often considered as academically inferior. However, the inability of the university sector to provide the skills required by industry and their conservative nature has lead to polytechnic degrees being seen as more vocationally relevant (UK polytechnics, for example, pioneered Business Studies degrees).

Funding - currently the Finnish Polytechnics can use local funding, without reference to the performance indicators applied to universities. Polytechnic teaching is normally cheaper and utilises higher staff student ratios than universities. Hence if both Universities and Polytechnics provide degree schemes, the Polytechnic cost model could be used to push down higher education costs across the entire system.

Role in the H.E. Network and Virtual University - Polytechnics have usually been concerned with teaching, rather than research, with a vocational rather than academic emphasis and the mission statement for polytechnics in Finland is functional, while that of universities is inspirational. Hence, if the National Virtual University is concerned with continual professional updating, and teaching as well as research, the polytechnics should have a major role.

Open University Activities

The development of distance education and Open University provision in Finland was organic and grew out of supplementary holiday courses for primary school teachers first organised by Helsinki University at the end of the 19th Century. The subsequent development of summer universities in Finland, first in Jyvaskyla and Turku Universities, and then in the major cities that sought the establishment of permanent universities in their municipalities, provided both the building blocks for Open University provision and its particular Finnish character. This guarantee of parity of regional educational provision was an important factor in the development of Finnish OU activities.

STAGE 3a Regional/Local Design and Development Projects	National funding Council for higher education	Regional/Local Government Agencies	National and Regional Business Consortia	Academic administration (departmental, institutional or national)	Resource administration (departmental, institutional or national)	Courseware development team (Inter- or intra-institutional)	Discipline area (Departmental, institutional, or national)	Individual academic lecturer
Establish local/ regional project teams	Define national and local responsibilities, terms of reference, chairs and membership	Provide physical resources for local/ regional teams, and representatives	Identify and provide suitably qualified representatives for local/regional teams	Identify and provide suitably qualified representatives for local/regional teams	Identify and provide suitably qualified representatives for local/regional teams	Identify and provide suitably qualified representatives for local/regional teams	Identify and provide suitably qualified representatives for local/regional teams	
Draw up local implementation plan	Ensure goodness of fit with national plan. Agree and implement formative evaluation and progress reporting strategies	Ensure goodness of fit with local/regional plan	Ensure goodness of fit with corporate plans and aspirations	Ensure goodness of fit with national and institutional plans	Ensure goodness of fit with national and institutional plans			
Set up a teaching and learning development team	Tie funding to meeting of standards and project completion deadlines	Identify specific software needs for local community	Identify and second staff for course development work	Monitor composition and working of team		Identify and involve people with complementary skills and knowledge	Provide subject and teaching and learning expertise	Provide subject and teaching and learning expertise
Set up a technology transfer development team	Tie funding to meeting of standards and project completion deadlines	Identify specific software needs for local virtual science park and technology transfer work	Identify specific software needs for local virtual science park and technology transfer work		Identify specific software needs for local virtual science park and technology transfer work		Identify specific software needs for local virtual science park and technology transfer work	
Set up a computer network team	Agree compliance with national plan and project completion deadlines	Identify extent of compliance with national plan and need for local variation	Identify extent of compliance with national plan and need for local variation		Identify extent of compliance with national plan and need for local variation			
Set up a support services team	Agree compliance with national plan and project completion deadlines	Identify compliance with national plan and local needs for career and employment advice and public service support features. Identify cmc needs and facilities	Identify compliance with national plan and local needs for vocational guidance, health and safety, continuous professional upadating, and research and tecnology transfer support services. Identify cmc needs and facilities	Identify compliance with national plan and local needs for multimedia, student support, electronic library facilities, on-line course assessment, learning diagnostic tools Identify cmc needs and facilities	Identify compliance with national plan and local needs for course registration, student tracking, on-line payments, Identify cmc needs and facilities	Identify course ware support and cmc needs and facilities		

STAGE 2 National/Regional/Local Data Gathering and Consultation	National funding Council for higher education	Regional/Local Government Agencies	National and Regional Business Consortia	Academic administration (departmental, institutional or national)	Resource administration (departmental, institutional or national)	Courseware development team (Inter- or intra-institutional)	Discipline area (Departmental, institutional, or national)	Individual academic lecturer
Assess national/regional labour market needs	Collate data from regional agencies	Undertake skills audit, provide labour market data	Assess corporate demands for skills and competences		Provide alumni data on 'First Destination' of graduates and postgraduates, and level of local/regional graduate retention		Provide academic analysis on labour market trends	Input via involvement in teaching and research
Address demand for undergraduate, postgraduate and professional courses	Utilise macro level higher education statistics on course demand	Analysis of future demand from local schools	Audit future needs for graduates and the need for continual professional updating	disaggregated data on local/regional demand for courses			Provide data on demand for existing subjects	
Assess needs of other potential users – socially excluded groups and University of the third age	Examine demand for courses from excluded groups	Produce demographic analysis to identify need among disadvantaged groups and third age students	Identify training required to enable minority groups to enter the world of work	Assessment of provision for minority groups (e.g. disabled)		Identify learning difficulties of disadvantaged groups	Report barriers to h.e. entry identified by applicants from minority groups	
Assess research and technology transfer needs of national and local industries and businesses	Collate data from other sectors - national economic aspirations and research and technology transfer needs	Assess needs of local businesses and industries, and provision of science parks and technology transfer	Assess current level of research and development skills, current and future involvement in science parks, and estimate future demands	Assess current level of research activities and estimate future demand for collaborative work via NVU	Assess current level of research activities and estimate cost and resourcing implications of future collaborative work via NVU		Assess current research activities and aspirations for collaborative work via NVU	Assess current research activities and aspirations for collaborative work via NVU
Determine and validate course matrix and research profile for NVU, and fit with existing university activities	Aggregate regional data to produce national scenario and identify regional specialisms	Estimate local/regional costs implications for hardware needs		Assess impact of NVU delivery on teaching and research	Assess impact of full course delivery on existing resource	Assess current level of core course delivery	Identify areas of teaching and research excellence in subject domains and combinations	Input via Departmental involvement in teaching and research
Assess NVU start-up and running cost implications as full degree deliverer across course matrix and research partner	Estimate additional financial resources for start-up and running costs of NVU			Provide estimates of additional staff and infrastructure resources needed for start-up and running NVU	Estimate resource implications of starting and running NVU degree programs across all universities	Estimate needs for new software, hardware upgrade, and staff development	Provide estimates of additional staff and capital resources	
Translate Vision into regional tactical units	Assess inputs from other agencies and consortia	Identify regional needs and strengths	Identify national and regional needs and corporate strengths	Identify national and regional needs and corporate strengths	Identify national and regional needs and sectoral and institutional strengths	Identify national needs and sectoral and associational strengths	Identify national and professional needs and strengths	
Initiate Project Planning Teams	Appoint national planning team	Establish regional teams and identify national representatives	Identify representatives for national and regional teams	Identify representatives for national and regional teams	Identify representatives for national and regional teams	Identify representatives for national and regional teams	Identify representatives for national and regional teams	Identify representatives for national and regional teams

Like the activities of other Open University in Europe, Finnish Open University provision saw a sharp increase in student numbers which grew from some 39,000 students in 1990 to 75,000 by 1996.[116] However the philosophy of Finnish OU activities differs from those of other European OUs. Finnish Open University activities comprise “an open learning system constructed to further equality in education, which means that the open university is not a separate educational organisation but that teaching is realised through a cooperation network. … The open nature of teaching is intended to promote educational and regional equality.”[117] This cooperative and regional aspect means that most Finnish universities participate in Open University work by providing teaching in cooperation with some 300 organisations, in over 200 municipalities. This community aspect, which derives from the original summer school movement, is a strength and a dominant feature of Finnish Open University activities. Hence, although there are OU activities in Finland, there is not a singular Open University institution.

The collaborative basis for out-reach education in Finland, derived from co-operation with existing colleges and universities, meant that open university provision in Finland evolved as a collaborative activity, rather than through an autonomous open university, as occurred elsewhere in Europe. This close association with existing educational institutions also meant that Finnish OU teaching was similar to that in the campus universities, rather than, as in the UK OU, being tailored specifically to promote entry by those with little or no formal education. In addition, the relationship between Finnish OU activities and their constituent university providers is designed to enable students to obtain degrees at the campus based Finnish universities as full time students. Hence unlike Open University students at the UK OU or the FernUniversität (in Germany), or UNED (in Spain), students in Finland cannot be awarded Open University degrees through part-time study.

The provision of OU activities at existing campus based universities in Finland means that conventional face to face contact teaching is most commonly used for OU students. However guaranteeing regional equality of access means that where physical distances and climatic conditions make direct ‘talk and chalk’ delivery impracticable, tuition is provided through other modes, including video-conferencing and more frequently, the use of web-based environments, which has been aided and accelerated by the high level of information technology in Finland. The new technologies are an integral and dynamic sector of the nation’s economy, and their increased use is affecting all parts of Finnish society, including education. Hence audio and video contacts, audio-graphics, radio teaching, hypermedia, electronic mail, the Internet etc., are all playing a major role in improving the accessibility of open university teaching, and enhancing choices of delivery modes for students.

Since the start of distance education, both via existing campus based universities as in Finland, and in separate Open Universities (in the UK, Germany, etc.), considerable expertise has been developed in the production and delivery of distance education, initially in print based format but later in other media such as television. These institutions have also undertaken research into new methods of teaching and learning, including the effectiveness of different pedagogies. Consequently, open universities are the natural and obvious institutions to develop the use of new information technologies, which enable new forms of learning materials to be produced and then delivered anywhere in the world, and synchronous and asynchronous communication between tutors and students, at negligible cost.

Finnish Open University provision has been very successful in enabling 'second chance learners' to get into tertiary education, and has developed in a specific way, reflecting Finnish history and culture. In respect of its contribution to a National Virtual University, the following are worthy of note:

Degree awards - all other Open Universities in Europe provide complete degree schemes, and there is no reason why this should not be the case in Finland, within a virtual university delivery mechanism. Such a development would give the Finnish OU equal status with other national OUs (such as the FernUniversität, UNED, etc.) and give students at the Finnish OU equal status with students elsewhere.

Flexibility to meet Students' Needs - at present Finnish OU students have to complete their studies within a conventional university programme, although their personal circumstances may make continuation of OU tuition throughout a degree programme more preferable - the NVU would enable this to happen.

Collaboration - the Open University provision in Finland grew out of collaboration, which is still a major factor explaining its current strength, hence the virtual university project must ensure that this collaboration is sustained and enhanced. However, "currently the open university system does not form a consistent whole; every university has its own focal areas and modus operandi. This has caused a certain amount of overlap and lack of coordination at regional level,"[118] the NVU could help to overcome these problems.

Promotion of Equality - women account for 70-80% of open university students, and the promotion of gender equality has been a most successful part of OU activities. The continued promotion of equality should be retained as part of the National Virtual University activities.

Promotion of Lifelong Learning - the promotion of lifelong learning requires a more flexible structure and approach than currently exists in most campus based universities. Extending Open University activities and creating a NVU, will inject a new level of flexibility into higher education.

Table 7: Implementation Strategy for a National Virtual University

STAGE 1 NATIONAL POLICY FORMULATION	European and National Government Agencies (Ministries)	Regional/Local Government Agencies	National and Regional Business Consortia	National and Regional ICT Providers (Television, radio, phones, publishers)	University, Open University and Polytechnic Sectors	Academic Staff Associations and Trade Unions	Professional Associations	General Public
Exercise strategic foresight and address implications of possible future global trends	Discussion at European Council of Ministers and National Government level of global social and economic trends	Gather historical data, interpreted at regional and aggregate national level, estimate likely future trends	Gather historical data, interpreted at regional and aggregate national level, estimate likely future economic and labour market trends	Gather historical data, interpreted at regional and aggregate national level, estimate likely future ict trends	Gather appropriate data, interpreted at regional national and international level, provide analysis to extrapolate likely future trends	Gather aggregate data, and provide analysis at national and sectoral levels	Gather data at appropriate international fora	Data gathered via opinion polls and government household and social surveys
Identify European and National Information Society Objectives and Policy Options	Discussion at European Council of Ministers and National Government level of global policy objectives and options	Regional discussions input to national level and European Level via the Council of the Regions	European/National/Regional discussions, input to EU debate via the Economic and Social Committee and to national level via links with national government and parties		Institutional, regional and sector wide debate, academic analysis of policy options and contributions to policy making at regional and national level	Sector wide debate, analysis of impact of policy options and contributions to policy making at regional and national level	Regional/European debates and discussions via professional conferences, journal articles, etc	
Define and disseminate vision, secure consensus	Intergovernmental meetings at EU level, governmental meetings at national level	Disaggregate vision to regional and local level, assess impact, initiate discussion and feedback data	Assess impact at sectoral and company level, initiate discussion and feedback data	Assess implications for ICT suppliers, initiate discussion and feedback data	Assess impact at regional, sectoral and institutional level, initiate discussion and feedback data	Assess impact at institutional level and individual level, initiate discussion and feedback data	Assess impact on national professional qualification structures and training delivery	Institute public debate, assess and feedback public opinion
Refine and finalise national vision, assess macro resource requirements	Receive feedback and finalise vision, assess national resource requirements	Preliminary assessment of regional resource requirements	Assess sectoral and company implications and resource requirements and inputs		Assess sectoral, regional and institutional implications and resource requirements	Assess impact at institutional level and individual level, and resource implications	Assess impact on future job roles and professional training.	Bring vision into the national arena via ministerial press releases, newspaper coverage of government policy.

connectivity) and its higher education provision provide a sound basis on which a National Virtual University could readily be built. Such an institution would promote social welfare, economic well-being and political cohesion at personal, local and national levels. If a NVU is constructed, it would play a significant part in realising the vision currently held by the Finnish Government for the development of an Information Society and a Knowledge Economy within the country, as well as demonstrating across Europe and beyond, that the nation is at the cutting edge and forefront in the use of newly emerging information and communication technologies. The need for a National Virtual University, and the competence to construct it within Finland, are well-established in this paper, along with some indication of what it might contain, and how it might be built. Moreover, as a recent cross-national study of the impact of borderless education observed: "We conclude that 'doing nothing' is not an option for higher education. Courage and creativity will be essential … to rise to the challenges of borderless education."[169] "If any major borderless development is to succeed, the role of senior management will be crucial, and effective leadership … will be needed."[170] However, as befits a flagship project of national significance, the final form of the NVU must be determined and agreed on through a process of widespread dialogue at local, regional and national level, which is as inclusive as possible. The worth and value of this paper will be judged by the extent to which it provides a useful input into that process.

Open Lectures - studia generalia lectures and the University of the Third Age have been undertaken for some time in Finland. The Natiional Virtual University would further extend public access to this kind of lectures / activities. Demographic trends and growth in the use of I.T. in the home and in the regional study-centers mean that these activities are likely to increase, the Virtual University development would enable an extension of OU activities in this area and at minimal cost.

Summary

The history and structure of the Finnish higher education network are distinctive when compared with other European states, particularly in respect of the collaborative aspect of Open University provision and the recent development of the Polytechnic sector. Additionally there are various aspects of the Finnish system which mark it as different from other comparable national systems in Europe and the USA, such as long completion times for undergraduates and postgraduates (especially doctorates), and limited use of both modular degree schemes and accreditation of prior experiential learning.

The national virtual university could build on the strengths of the existing higher education and could also provide a means of levering change to, inter alia:

- *establish a new, fully accredited, NVU able to provide a complete suite of undergraduate and postgraduate courses, award degrees, and compete on equal status with the other European Open Universities;*
- *provide generic "learning to learn" skills, which enable students, both within universities and the community more generally, to engage in the learning process, not just for a degree, but for life;*
- *promote the ethos of lifelong learning as a national policy priority, and provide a tangible and practical way of achieving it;*
- *maximise curricula choice by enabling a modular scheme which allows students to tailor degree schemes to achieve their career aspirations and accomplish personal fulfillment;*
- *enhance equity of opportunity by enabling accreditation of prior experiential learning for mature students who lack academic qualifications;*
- *interface with other private sector and corporate training providers to utilise high quality training outside universities, and enable sharing of best practice between public and private sectors;*
- *enable varying routes for degree completion - via both a conventional university and/or the virtual university, and in full and part-time modes, which could improve completion rates;*
- *enable collaboration in the development of new methods of teaching and learning within the higher education sector and fast dissemination and embedding of new methods across the sector;*

- *enable collaboration in subject based research within the higher education sector and fast dissemination and embedding of research results across the sector, through an electronic library within the national virtual university;*
- *facilitate greater collaboration between industry and higher education via the accreditation of corporate training courses, and the growth in Work Based Learning Degrees;*
- *enhance technology transfer and research dissemination from the h.e. sector to industry through a virtual science park.*

6 Implementation Strategies

The implementation process will vary in accordance with which NVU model is adopted. Clearly, the implementation strategy can only be finalised after the project has been agreed and a project specification produced. Hence this section is indicative and designed to show the bare bones of the implementation process, and also (by relying on successful implementation elsewhere) to bench mark some best practice. This implementation strategy has been created on the assumption that the final NVU model will be that of a National Virtual University as outlined in table 6 (i.e. a fully wired national degree awarding university, with research and technology transfer facilities). Clearly if a lower or higher level model is chosen, the implementation strategy will need to be altered accordingly. The implementation plan will be circumscribed by the form of the NVU, which will itself be defined through an extensive process of dialogue between staff at all levels. As Thompson notes: "It seems axiomatic that information technologies will be highly significant in the delivery of teaching and learning; the real debate is over the issue of 'which sort', with 'when' and 'where' and 'why' being key underpinnings."[167]

Implicit within the implementation strategy proposed here is that the major drivers for this project will be regional learning communities, geographically defined and comprising higher educational providers, local/regional government agencies and business communities. There are five reasons for suggesting the community as the major mode for implementation. First, a devolved structure for delivery can more readily cope with the complexity of a project of this size. Second, the tradition of a consensual approach to higher education and Open University provision in Finland provides a well-tested structure for collaborative projects. Third, there is a well developed literature demonstrating the utility of building regional learning communities.[168] Fourthly, by allowing different regional learning communities to build different parts of the NVU in parallel, there is a greater sense of involvement across the sector, moreover the time taken to complete the project is reduced. Finally, the individual higher educational providers have different roles in accordance with their areas of research expertise, their links with local and national business and their historical development. For example the National Library of Finland is located within the University of Helsinki, and so it makes sound economic sense for the NVU Electronic Library to be developed there.

This paper has outlined the international/national/regional parameters which currently operate and which demonstrate the need for Finland to establish a National Virtual University. Additionally it has been shown that both the socio-economic framework of the country (with its internationally high usage of new technologies as witnessed by, inter alia, mobile phone usage and internet

The success of a NVU will be enhanced if it is well integrated within the local/ regional knowledge economy, and has strong links with other corporate providers within knowledge based sectors.

Both the California Virtual University and the Western Governor's University projects confirm Laurillard's analysis that to make the shift to using new technologies in university teaching successfully requires a quantum leap involving new and different educational techniques and activities, rather than an incremental step premised on re-casting and re-engineering existing teaching and learning practices.

The structure of a NVU will vary in accordance with the functions it is asked to perform, the smaller the number of functions included, the lower will be both the risks involved and the possible returns. Above a certain level of functionality, the returns start to rise steeply and extend beyond the purely educational.

4 Building a National Virtual University

The rationale for a NVU

Before starting to build a National Virtual University, it is necessary to critically consider the rationale for such a project. History has demonstrated that many of the promised benefits of new technologies in teaching (as for example the introduction of television) either failed to materialise, or had significantly smaller effect. Moreover, the adoption of new technologies for learning is a great, and probably irrevocable, step for a university to make, and the risks are heightened if this is part of a national strategy. Hence, close examination of the arguments and issues surrounding the use of new technologies is required to ensure that such a project is viable and fully justified in financial and educational terms. Assessing the impact of new technologies on traditional campus based universities, the Director of the Information Centre of the International Association of Universities found that: "New information technologies, and particular the Internet, in dramatically transforming access to information, are changing the learning and research process, how we search, discover, teach, and learn. … Universities must face up to this challenge. … The future of universities depends on the capability to adapt to the new information society and meet the needs of an ever more demanding professional market."[119]

In her article on *Telematics-Supported Education for Traditional Universities in Europe*, Collis states that there are "three compelling clusters of reasons why faculties in traditional European universities need to re-examine their instructional practices and change their didactic methods."[120]

The Need to Re-Affirm Principles of Teaching and Learning - the traditional instructional methods of most universities are followed without critical appraisal of their raison d'être. The shift to new ict delivery will cause a move from knowledge-based instructor-transmission models to models which are process based and learner-oriented, and involve the construction of knowledge.

Changing Student Demographics - the growing diversity of the student body requires educational programs which reflect this diversity. As Collis states "There are moral, social, and financial reasons to adjust traditional university programs to these increasingly diverse cohorts"

Demands For More Flexible Education -flexibility will be required in:

- **Location** - where the learner can carry out learning activities
- **Programs** - where there will be need to allow a variety of courses in accordance with learners' needs and interests

- **Types of Interactions** - students do not need to always work individually or in groups, and not all the group members need to be in the same place and at the same time in order to learn.
- **Forms of Communication** - within a course learners and instructors will require a wider variety of more targeted and responsive communication than occurs in traditional lectures.
- **Study Materials** - students will need a wider range of choices and modalities from which to learn.

Following the work of Collis, McCormack and Jones (in their book *Building a Web-based Education System)*, pose the fundamental question 'Why Build One?', and look at the benefits and problems relating to the shift to telematic delivery, identifying the following:[121]

Benefits

- **Computer Mediation –** all the information on a course is stored on a computer, so students can adapt the information to their own needs, thus increasing control over their own learning experience. When computer mediation is used in a tutorial, the resultant text can be stored and used directly as a learning resource, which would not occur in a face-to-face interaction. It also enables tracking of student progress and participation which allows staff to generate student reports, identify problems, and tailor the delivery of material to suit individual learning styles.
- **Geographical Independence** - students can study wherever they want, learning is not confined to the physical campus. Additionally, there is no delay in distributing new information to distant students - they can access it as soon as it is put on the website. The accelerating decline in the cost of computing hardware and telecommunications access makes it possible and cost effective to study from home or work.
- **Temporal Independence** - as web based learning material can be accessed anytime and anywhere, there is no need for staff and students to synchronise lecturing timetables. Where asynchronous computer mediated communication is used, this also applies to tutorials and seminars. Students never miss lectures and are empowered by determining when and where they learn. Staff do not miss lectures, and have more time for student support and developing scholarship and research**.**
- **Platform Independence -** many modes of computer assisted and computer based learning are machine specific and may require specific hardware, by contrast the WWW is largely platform independent.
- **A Simple Familiar Interface -** the popularity of the WWW means that many students entering a web-based classroom, already know how to use it. The relative simplicity of the web means that new learners can access packages

Determining which model best fits on to the existing higher education structure, yet also fulfills the aspirations for a NVU to deliver the Information Society, will involve both agreed explicit formal criteria (measurable costs, desirable outcomes) and informal pressures (political acceptance, the push for geographical equity in the allocation of funds). For example it would be possible to conceive a NVU based around the UK Open University and University for Industry models, with a NVU with the ability to grant degrees and commission learning materials from existing universities, who would also provide local tutorial support for NVU students. Within such a model, common subject content would be provided both to students registered to existing universities and studying on-campus and NVU students studying at a distance, based around universal open learning multiple media materials, increasingly delivered via computer, but with students on campus having direct face-to-face support from tutors, while students at a distance communicate with tutors and with their fellow students (located both on and off campus), through new technology. Tutors would therefore have responsibilities for tutoring students registered at the own campus, and those studying via the NVU. Hence the NVU would be different from both a traditional distance provider, where there is no face-to-face interaction with the originators of learning materials (but mediated communication with tutors), and from a campus university in which distance teaching (if it is undertaken at all) is provided as a separate and distinct activity, which runs parallel to the mainstream teaching based on "chalk and talk" delivery, allied to group support through large tutorial and seminar groups. This convergence of what has traditionally been called 'distance' with 'on-campus' teaching provision means that NVU on-line learning and teaching materials are available to both local and distance students through the same Web browser interface in a system of 'distributed on-line learning'. By making these materials available to all students, their average cost per user is much reduced and their educational impact maximised.

Summary

The opportunities presented by a NVU will be best exploited if it covers a full range of university features including (not only) teaching, (but also) research, technology transfer, careers advice, and if it links to local/regional learning communities. Such a university would be a world leader, in that previous projects have been concerned wholly with either teaching (e.g. the CVU) or research (e.g. the Leeds Science Park) but not both.

The experience of the California Virtual University suggests that a collaborative NVU based on existing providers and with a low level of functionality, produces insufficient benefits to be either cost effective or viable, and that the level of financial resources is less significant in determining success than the careful design of the project.

Table 6: The Impact and Costs and Benefits of Possible Types of National Virtual University

Structure	Impact/Costs and Benefits
International Virtual University: all the features of a national virtual university, and linkages to global educational suppliers with cross-national course sharing, virtual student mobility, and the export of courses overseas in English.	Fundamental across global society, providing "cutting edge" multiple teaching and research functions both within the nation state and as a global exporter of high quality education.
	High costs, which are spread across the nation state and international knowledge corporations, but producing additional external high returns in respect of international profile and export of educational goods.
National Virtual University: a fully wired new national university, awarding degrees and networking all existing higher education institutions with home and work locations, facilitating research and technology transfer and linking to other institutions horizontally in the knowledge economy.	Highly significant within the nation state, providing "cutting edge" multiple teaching and research and technology transfer functions within the nation state, and helping to link all facets of social, economic and cultural life within the Information Society.
	Moderate costs spread across the nation state and with corporate partners, but producing economies of scale in educational effectiveness, and significant returns in national prosperity, social cohesion, equality of opportunity, and individual fulfillment.
OU On-Line: extension of existing Open University activities involving new technologies for learning, but leaving degree awarding powers and research and technology transfer functions to campus universities.	Increased equality of educational opportunity, with possibility of enhanced links between universities with greater student choice. Negligible effect on research and technology transfer and the creation of an Information Society.
	Low costs, easily born by the nation state, some economies of scale (dependent on inter-university collaboration) in delivery, but comparatively low returns.
Portal Site: designed as a "shop window" and entry point to existing on-line delivery by conventional universities.	No impact on existing higher education providers or open university provision or but increased access to information for potential students.
	Negligible costs which could be met by the participating universities.

with minimal effort. Moreover the growth of the web into all domains of personal and commercial life, means that skills in accessing the Internet have a relevance beyond education.

- **Increased Communication** - the Internet allows students and staff to talk to each other, individually and in groups.
- **Increased Learner Control** - all the above benefits increase the control of students over their learning experience, leading to increased confidence and motivation.

Problems

- **Access and Resources –** in most Western industrialised nations, access to the Internet is readily available, but this is not the case in less-developed countries. However, the growth of the Internet and computer usage worldwide, means that this problem is fast disappearing.
- **Cost** - for on-campus students, Internet access is included in tuition fees, while those learning at work may also have corporate access at little or no cost. For home-based students the cost of access may be an issue although, as with all aspects of ITC, the cost is declining fast. Hence, web-browsers can now be downloaded free of charge, telephone access is now through a vpop (virtual point of presence) and charged at the cost of a local call, and internet providers (e.g. America On-Line) now offer free access.
- **Training** - although the use of the Internet is widespread, many students will still require some training to maximise its utility.
- **Adapting to New Methods** - the pedagogy required by Web-based learning is different from that currently used in Universities. Staff and students only possessing experience of traditional teaching methods will require training and support to make the shift.
- **Infrastructure, Support and Administration** - a telematic university requires new skills of administrators and managers, who have to deal with new ways of allocating resources and administrative procedures and protocols.
- **No Uniform Quality** - as a technology and an instructional medium, the Internet is still in its infancy. Hence the information it provides is not stable - URLs which may provide supportive material for students may disappear. Similarly, the competition between software companies (primarily Microsoft and Netscape) to achieve a dominant position in the markets for Web browsers and HTML script through product differentiation, may mean that an application which works for one student, may not for another using different software.
- **Copyright, Privacy, Security and Authentication** - the laws on intellectual property rights are currently being re-written in the face of developments arising from ICT, which enables text, music and pictorial and graphical images to be transported internationally at negligible cost. The problems of plagiarism and

authentication of students' work have always existed, but are likely to increase with greater use of ITC in education, although it is also providing an increasingly sophisticated set of tools to identify and combat the problems.

Hence the rationale for individual universities to move to virtual provision is well proven and documented. Assembling a National Virtual University requires appraisal of those factors relevant to individual h.e. institutions, but also has factors other than the purely educational which need to be considered:

Promoting Social, Economic, Political Cohesion and Integration within the Nation - a Finnish National Virtual University will act as a major deliverer of learning, enabling greater access to education, thus improving national economic performance and enabling personal fulfillment. Additionally, by incorporating other activities (like research and development, technology transfer, career development, third age learning) it becomes a vehicle to promote life long learning, and has a major role in building an Information Society in which new technologies form a seamless communication web throughout and within peoples' lives, connecting them in city offices and forest cottages, to work and leisure, to culture and learning, to politics and civic affairs, and above all, to each other. This macro level role can only be achieved by a national level institution, as none of the individual universities have sufficient resources to undertake such a task, and moreover any particular university given the task would be beset by the political problems and institutional rivalries which exist between universities.

Achieving National Priorities - Economic Growth - where individual universities promote economic growth in their local/regional hinterland, this is seen as a bonus to their central raison d'être of education and research. By contrast, a National Virtual University will have a direct strategic responsibility for helping to lever economic prosperity for all, by creating an Information Society and a Knowledge Economy. By extension, a further consideration is the costs and benefits of not investing in the building of a national virtual university. Finland's dominant position in the telecommunications industry is unlikely to be maintained or strengthened without investment of this nature, while the speed of development of new technologies may mean that delaying investment in a NVU may be more costly in the long term, as competitors get further ahead.

Addressing Social Issues - Equity And Opportunities - similarly, individual universities have a responsibility to improve access and maximise educational opportunities but this is subject to their own entrance policy and requirements to maintain academic standards. A National Virtual University will form an active and highly visible part of the national framework for opportunity and access. There are clear social advantages to using new information and communication technologies to meet the educational needs of people who could not otherwise be reached or were unable to benefit from the educational and training opportunities of existing campus based universities.

Business Support And Development	***Business Training and Staff Development***	Joint Accreditation of courses	On-line Vocational Guidance	On-line delivery of shared generic packages required by legislation (health and safety at work, equal opportunities)	On-line courses for basic IT skills and other interpersonal skills	Continuous Professional Updating	Work Based Learning Post Graduate Programs	Student feedback	Preparing for Learning in Retirement
	Business Research and Development	Online MBAs	Work Based Learning Undergraduate Programs	Guests experts speakers from Business and Academia	Business Simulations	On-line Conferences and Seminars	Advice on Grants for investment and training		
	Data Handling	Managing records	Analyzing and tracking students	On line Billing and invoicing	Monitoring Staff Shortages Labour Market Needs				
Career Development Support Materials	***Job Search***	Local/Regional Job Vacancies	Company Websites	Public Sector Websites	University Postgraduate Prospectuses	Voluntary Work Websites			
	Careers and Employment Advice	Careers Planning and Counseling	CV Writing and Job Applications	Interview Techniques	Employment Rights	Coping with Redundancy	Returning to Work	Preparing for Retirement	
Local Virtual Community	***Public Services***	Bus/Train/Plane Timetables	Local Library Online	Local Maps	Arts and Culture	Tourism			
	Local Government	Email to M.P.s and Councillors	Local Virtual Forum	Education	Social Services	Housing	Community Care	Health and Hospitals	Job Opportunities
	Commercial	Online shopping	Job Opportunities						

Administrative Staff Support Tools	***Staff development***	Curriculum Re-engineering	Curriculum Management	Building knowledge and new competences	Team Building	Building motivation	Marketing		
	Administration	Installation	Authorization	Registering	On-line fees handling	Server security	Resource monitoring	Remote access	Crash recovery
Technical Hardware Software Overview	***Server Platform***	Disk Space	Windows NT 4.0 Server	Apple Server	Linux Server				
	Client Platform	Minimum Level	Target Level						
	Pricing	Start-up Cost	On-going Cost	Technical Support					
	Limitations of package	Number of courses	Number of students	Number of connections	Number of instructors	Other Limitations			
Research Environment And Technology Transfer	***Virtual Science Parks (Separate Server space for Technopolis, Medipolis, etc)***	GUI as Physical Metaphor for VSP (sites, buildings, offices, document management	VSP Secure Information Gateway	Data Mining Tools	Organisational Directory	Academic Experts Directory	Research Resources Directory	Virtual Tenant on Unix Server	
	Asynchronous Sharing	E-mail	BBS file exchange	Newsgroups	On-Line Noticeboard				
	Synchronous Sharing	Voice Chat	Whiteboard	Application sharing	Virtual space	Group browsing	Virtual Seminars	Tele conferencing	Video conferencing
	Help desk	IPR Advice	Patents Advice	Partner Search	Advice on Private Finance	Advice on National and EU Grants	Job Vacancies		
	Virtual Research Laboratories And Technology Transfer	Sharing of user facilities, between Universities and Industrial Firms	On line library and information archive	Shared contracts between universities and business	Virtual Exchange of staff, e.g. student placements	Online secure consultation and information exchange	Co-operative Research and Development Agreement		

Ability To Invest And Bear Risk - individual universities are of insufficient size to invest in the large sums required to produce high quality multiple media used for delivery via new technology. As Arbeles observes “the Mega institutions have realised that they need to invest heavily in professionally produced packages. … The high front end capital investment yields a greater return over the time than the current conventional approach of a single professor who must master content, process and delivery. … Capital strapped conventional tertiary institutions are trying to bootstrap into the market place.”[122] Furthermore even if individual universities could raise the substantial sums to ‘go virtual’, the financial risk involved would be very high for a single institution to bear. By contrast, a National Virtual University, would have the ability to raise the large sums required and, with government backing, would be able to bear the risk, as well as negotiate collaborative sponsorship agreements with national and international corporations.

Economies Of Scale - allied to the previous point, a National Virtual University would have the ability to raise the large amount of capital needed to build a virtual campus, and would also be able to gain the economies of scale which are only available when there are large numbers of students able to utilise the learning materials which may be very expensive to create. Additionally, by bringing together geographically separate students within a virtual classroom, the NVU may be able to run courses which individual campus institutions would regard as financially unviable, thus increasing students’ choice of courses. Similarly, it is becoming increasingly difficult for all universities to maintain a full stock of academic journals, and more and more publications are now available on-line (such as the Oxford English Dictionary and the Encyclopedia Britannica). By establishing a National Virtual Library to which all students had access, the average cost per user could be brought down.

Protection Of the National University System - American universities and corporations are already gearing themselves to export their products, and their size and financial resources are such they would be able to compete with existing campus based universities, especially where (as is the case in Finland) the population is fluent in English. Tiffin and Rajasingham pose the question: “With the incentive of global markets, we could imagine knowledge-based companies investing in the design, development and marketing of virtual environments in an information society in the way that the giants of the automotive industry now invest in motorcar manufacturing for the industrial society. How could a conventional teacher with conventional resources compete”?[123] Similarly a recent cross-national study noted that “a more direct threat to individual universities is emerging from international consortia of universities or consortia of universities and commercial organisations.”[124] The size and the population of Finland is such that only a university built at national level will be able, in the long term, to compete with the growing number of global knowledge providers.

Market Leader In The Global Knowledge Economy - by utilising resources at national level, a Finnish National Virtual University will not only be able to withstand the competition from other global players, it will also be able to enter such markets itself. The very high level of English fluency in Finland gives it a clear advantage in such markets, as does the high level of expertise in ict, and cutting edge technologies such as Wireless Application Protocol. Additionally by having a greater size and scope than existing individual campus based universities, a Finnish NVU would be able to collaborate with other national providers, such as the UK OU, UNED in Spain, the FernUniversität in Germany, who, by virtue of their size and expertise, are able to source money from multi-national agencies like the European Commission, UNESCO and the World Bank.

Protection Of National Culture - the encroachment of the English language and American culture across the world is pervasive and insidious. Nations such as Finland are particularly vulnerable, firstly because there is no one official language - Finnish, Swedish and Sami are all spoken, secondly because these languages are not widely used across the world. Education has a major responsibility in preserving and maintaining the cultural heritage of the nation, more especially in Finland where language and literature have been central to the nation's struggle for independence - Lönnrot's *Kalevala* was of fundamental importance in this respect.[125] By teaching and research, Universities both safeguard and facilitate the transmission of the nation's language and literature, visual, musical and performing arts, and aid their continuing development. Hence Universities act as repositories and guardians of national language, literature and culture (as in the role of the Sibelius Academy, for example), and are icons of the intellectual accomplishments of nation states. Hence a National Virtual University will use new technology to network the nation and protect against further dilution of national culture and language (and the impact of "McDonaldisation"). For the English speaking world such fears may seem overstated, however a recent study for the Foundation for Endangered Languages has shown that every two weeks a language dies somewhere in the world, never to be uttered again, and over 3000 human languages will disappear within a century.[126]

The rationale for a virtual university is well established at micro institutional and macro national levels, and it is evident that the trend towards on-line delivery of education across the world is inexorably upward. However, to ensure that a shift to the use of new technologies in education does not dilute the learning experience, it is essential to ensure that the pedagogies utilised within a National Virtual University are appropriate to the use of these new ways of on-line learning.

Defining the Pedagogy of the Virtual University

Irrespective as to what level or type of technology is used in education, as Clark astutely observed, "Learning gains come from adequate instructional design theory

Table 5: Major Features of a National Virtual University

Intensely Supportive Learning Environment	***Multiple Media***	Real Audio Lectures	Video on Demand	Video Cassettes	Audio Cassettes	CD Roms	Multimedia presentations	Simulations	Pdf workbooks
	Web Browsing	Electronic Library	Search Engines	Dictionaries	Bookmarks	Citation Indexes			
	Asynchronous Sharing	E-mail	BBS file exchange	Newsgroups & Discussion Group					
	Synchronous Sharing	Voice Chat	Whiteboard	Application sharing	Virtual space	Group browsing	Cyber Caf. for informal chat	Tele-conferencing	Video conferencing
	Study Tools	Learning Styles analysis	Learning Log	Tutorial Programmes	Diagnostic Tools	Recording (including note taking)	ITC training	Self-assessment	Group assessment
		Progress tracking	Data Searching	Motivation building	Study skill building				
	Help desk	Subject Tutor support	Learning resources support	Student mentor support	Work based mentor support				
Academic Staff Support Tools	***Student Support Services***	Entry requirements Assessment	APL and AP(E)L Assessment	On-line fees	Course Registration	On-line Course Assessment	Online Counseling	Virtual mobility	Careers Advice
	Curricular Design	Course planning	Course managing	Course customizing	Course monitoring				
	Unit Development	Instructional designing	Presenting information	Delivery Testing	Assessment strategies				
	Quality Monitoring	Instructional design protocols	Results monitoring	Student feedback					
	Data Handling	Marking on-line	Managing records	Analyzing and tracking students	Data base of Alumni				

to benefit from economies of scale and critical mass when they are being built and, given that in the long term only one platform will predominant, will be poor value for a high level of government expenditure. However, the NVU must be able to utilise the strengths of existing university and polytechnic networks and the collaborative networks which have grown up through the work of the Open University activities in Finland. On the basis of the CVU and WGU models, and the discussion of the Finnish higher educational system the following table provides a description of the type of elements a Finnish NVU might include.

Clearly the extent to which the features in Table 5 are adopted in building a National Virtual University, depends on which of the models of the NVU outlined above is chosen by the stakeholders. The nearer to the adoption of a Portal Site, the fewer of the features in Table 5 that will be incorporated in the final model, while if all the features of Table 5 were adopted, the resultant structure would look more like a National Virtual University as described above. To try to assess the relative merits of the various options, Table 6 summarises the features of various models of virtual university, ranging from a Portal Site to an International Virtual University, and their associated impacts and costs and benefits.

and practice, not from the medium used to deliver instruction."[127] New technology provides opportunities for educators entering the global on-line era. However, the creation of a new learning environment built on new technologies must be grounded in the appropriate pedagogic theories and the educational structures derived from them, which relate to these technologies. The impact of these technologies is such that old pedagogic models (even those relating to distance teaching) are no longer appropriate. As Skolnik (quoting Barr and Tagg) makes clear: "To build the colleges we need for the 21st Century …we must consciously reject the Instruction Paradigm and restructure what we do on the basis of the Learning Paradigm."[128] Similarly Sir John Daniel, Vice Chancellor of the UK OU warned about the costs universities in the USA would incur if they failed to adapt distance education to new technology thus: "I do not dispute your rights as Americans to define distance education as you like, even if you differ from the rest of the world. However, your current conception of distance education is not just a harmless deviancy. It prevents you from reaping the benefits of a revolution in higher education."[129]

However as David Hawkridge observes "there is widespread ignorance concerning how best to exploit the new media,"[130] moreover, computer based learning has been widely criticised for using poor teaching strategies, Van der Brande, for example, claims that "only 3 per cent of educational software has been written in the context of an articulated pedagogic rationale,"[131] while Speke and Powell are more overtly critical and characterise most of the available multimedia materials as 'multi-mediocre' or 'awfulware'.[132] All would agree with Reusser[133] that the design of a computer-based instructional system should be based on the content specific research of learning and comprehension, that is, the pedagogical model of the learner and the learning process. Thorpe argues that "We need to develop procedures and approaches which generate learning and develop self-aware learners and which also avoid either giving learners all the responsibility and no power, or leaving then to sink or swim. It will not be enough merely to provide the extensive multimedia resources which are being introduced in many institutions of higher education."[134] The use of ict in learning requires academic and learning support staff to re-think the nature of higher level learning, because, as Brittain et al have argued, it fundamentally changes the relationship of the learner to his/her university, tutor and learning materials.[135]

New technologies have changed distance teaching so that it now requires a new approach, which is what prompted Diana Laurillard, (ProVice Chancellor for Learning Technology and Teaching at the UK OU, which was the first of its kind and remains pre-eminent) to devote a entire book to *Rethinking University Teaching*.[136] Laurillard's basic premise is that "teaching is a rhetorical activity: it is mediated learning, allowing students to acquire knowledge of someone else's way of experiencing the world" in which the learning process is constituted as a dialogue between teacher and student. Hence "for learning to take place, the core

structure of the conversational framework must remain intact in some form,"[137] and computer mediated communication (CMC) enables this conversation to take place. Similarly Chambers argues "if one accepts the basic premise that the fundamental purpose of higher education is not the transmission of information but the acquisition by the learner of critical thinking skills, then it follows that the new digital learning media should be used in a manner which best facilitates a discourse between the learner and his or her mentor, rather than a one-way transmission of 'facts'."[138]

Hence, the changes required within the telematic pedagogy are not to do with supplying content in multi-media format via the web, (which is little different from supplying content by CD-ROM), but centre on computer mediated communication. As Laurillard points out "Stand-alone media-based packages will never be sufficient, because none of the media can adequately support the discursive activities that are essential for academic learning."[139] Bates[140] identifies the two crucial features which distinguish Computer Mediated Communication (CMC) from Computer Based Learning. First, CMC enables all learners to be in contact with each other and with their tutors as they enter a collaborative learning process – whereas previous cbl and distance teaching is premised on independent individual learning. Secondly, CMC means that students can access remote databases and download information into their own, and their tutor's own, computer, including subject content and textural messages. Hence students ***deal individually with*** the computer to obtain content information via cbl, but they ***interact collaboratively through*** the computer via CMC with other people and supplementary sources of data.

These two aspects of collaboration and interaction which CMC enables are ***crucial*** to the educational effectiveness of new technologies, and ***not*** the ability to provide subject content via the WWW unaffected by time and place. As Reeves demonstrates "there are still misunderstandings among higher education personnel about the potential of the WWW to support learning. As with previous innovations such as interactive multimedia, many faculty assume that the WWW is a 'magic box' and that simply putting a course on the Web guarantees better learning. (hence) …once instructional materials are on the Web, students will learn automatically. Actually, the WWW does not guarantee learning any more than the presence of a library on campus guarantees learning."[141] In this respect Sir John Daniel's warnings are pertinent: "Much of the commercial hype and hope about distance education is based on a very unidirectional conception of instruction, where teaching is merely presentation and learning is merely absorption. The Open University's experience with two million students over 25 years suggests that such an impoverished notion of distance education will fail – or at least have massive drop-out problems."[142]

Hence it is necessary to create a new structure in which the telematic, rather than the face to face, delivery mode is the norm for all staff;

- telematic delivery offers the potential to re-configure the learning process and move from an instructionist to a constructionist mode which is student centred.

Most crucially both the CVU and WGU experiments demonstrate that on-line learning is not merely an incremental step - those looking at online learning have to understand that they are not looking at new ways of doing what they have always done, but rather, that they are looking at doing **new things**. Online learning enables university staff not only to place texts and other materials on computer screens across the globe via the internet, it also allows university lecturers and students to use better and cheaper modes of communication. Hence it permits the **reshaping of learning**, and the end of inefficient broadcast modes of teaching, as the age of interactive learning comes into its own. Within this new paradigm of interactive learning, academics will have to surrender their traditional monopoly while students will have to surrender the "security blanket" of traditional passive instructional modes of delivery. Endorsing these views, in a speech delivered in Nova Scotia, Sir John Daniel stated "The knowledge media are not just a technical format, such as CD-ROM or computer conferencing, but the whole presentational style, the user interface, the accessibility, the interactivity. For our ability to transmit and manipulate symbols the knowledge media are such a quantitative advance, such a quantum leap, that they represent a qualitative change. Complacency is not in order. This is going to change universities."[165] Similarly Otto Peters, the Founding Rector of the FernUniversität, has opined that "If the university wishes to prepare itself for the tasks facing it in the future, it is not sufficient for it to regard the new technologies merely as additional media units and to misunderstand them as an extension and extrapolation of the previous familiar reaching operation … In concrete terms we are witnessing the change from traditional on-campus teaching to that of a university without walls; from a university that remains closed to many, to an open university; from an exclusive system of teaching and learning to an inclusive system."[166]

Determining a Virtual University Model for Finland

In designing a NVU for Finland there is a basic paradox which needs to be addressed. It is necessary to design a structure which can maximise the benefits of the use of new technologies to higher education in the most cost efficient way. The CVU was allocated $16 million for online learning, and six million for CVU, and went bankrupt, but the state of California, with a population of over 30 million people, was able to absorb this loss. Finland's population of circa 5 million may be less able to cope with heavy losses of an ill-conceived NVU project. Clearly, for example, developing parallel virtual structures in university and polytechnic sectors will make an overall national delivery pattern less likely, will be less likely

institutional autonomy to set its own direction or develop policy appropriate to its medium. Hence for a National Virtual University to flourish in Finland (or elsewhere), first, its relationship with industrial partners needs to be agreed and accurately defined, secondly, in recognition of the requirements and opportunities afforded by the use of new technologies in teaching, the NVU needs to be a separate entity from the existing higher education provision.

The other major virtual university experiment in the USA has been the Western Governors University. The Western Governors University was started in June 24, 1996 as a self-supporting non-profit corporation, unusually it offers a competence based approach and does not focus on the number of credits a student has accumulated but rather it certifies the competencies or learning outcomes that the student can document or demonstrate. Courses and programs were first offered in August, 1997 and although the WGU has fared better than the CVU, by 2000 enrolment was still slow.[163] Comparisons between the WGU and the CVU explore some of the reasons why the CVU failed. As Berg indicates the CVU "is obviously much more conservative and anchored in the control of the existing educational institutions with its faculty governance schemes. Under this model, technology will be used to augment traditional classroom courses and probably only have widespread use through continuing education."[164] Additionally Berg noted that the WGU sought separate accreditation while CVU deferred to the sponsoring university for credit. Hence the major difference between the two projects is that students in the Western Governors 'distance learning' program receive credits from the newly created 'WGU,' while those studying via the California linkup were to receive credits from participating institutions.

There was widespread agreement that the California project failed because it did not move to a completely student-centred paradigm, but instead was a collaborative venture using existing providers that did not provide any "value added." Hence this necessarily gave California's project less impact because students were not be able to complete a degree through the virtual university, only through individual institutions. In respect of devising a NVU for Finland, what can be learnt from the experiences of the California Virtual and the Western Governors University?

- a high level of financial resourcing may be less critical in producing success than a properly conceived organisational plan, which addresses the new opportunities for students provided by virtuality, by adopting new learning environments and the pedagogies associated with them;
- a virtual university organisation based on existing structures is less likely to succeed, because it requires collaboration between current educational providers (who are likely to be in competition);
- existing providers are unlikely to possess the managerial capacity to overcome resistance from existing academic staff and get them to shift away from course delivery based on face to face lectures towards telematic delivery via ICT.

For Laurillard the learning process must be constituted as a dialogue between teacher and student, which has the following characteristics:

Discursive

- Teachers and students conceptions should each be accessible to the other.
- Teacher and students must agree learning goals for the topic, and task goals.
- The teacher must provide an environment within which students can act on, generate and receive feedback on descriptions appropriate to the topic goal.

Adaptive

- The teacher has the responsibility to use the relationship between their own and the student's conception to determine the focus of the continuing dialogue.

Interactive

- The students must act to achieve the task goal.
- The teacher must provide meaningful intrinsic feedback on the actions that relates to the nature of the task goal.

Reflective

- The teacher must support the process in which students link the feedback on their actions, to the topic goal, for every level of description within the topic structure.

Laurillard's study is not a theoretical exercise, but uses studies of student learning to develop a methodology for the design of multimedia teaching that builds on what is known, and then applies the methodology to the whole academic system. In undertaking this process, Laurillard specifies the key assumptions which underwrite the resultant system, these are:

- **Quality is best established through organisational infrastructure and collaboration**. As Bates[143] argues, the high cost of developing good quality multimedia shows that a collaborative approach is most effective.
- **Design must address the entire learning process** – new technological methods of teaching cannot be introduced in isolation or as an incremental addition. Designing the course material must come after the overall learning paradigm has been specified, and the delivery of content via multi-media and the WWW must conform with known research on screen design to aid distance teaching utilising CMC.
- **Organisational infrastructure must be cyclical to ensure improvement** – the 'goal-action-feedback-revise action' cycle should be evident at all points in the organisational process.

- **Implementation must address the context of learning and teaching** – all aspects of the academic function – teachers' attitudes, course scheduling, administration, technical and academic support, assessment modes, must all be conducive to enabling students to use the new technology.
- **Academic knowledge is different from experiential knowledge** – new technology tends to support a fragmented, informational view of knowledge, but academic knowledge has an integrative character, which is distinct from information. This philosophy of the integrative (rather than informational) view of knowledge must be built in to the design process of distance teaching courses delivered via the www, before the units are created, not after.

Laurillard is explicit that students' use of technology must be an integral part of the student experience. Hence an organisational approach must be adopted, in which "teacher's attitudes, other course teaching, scheduling, logistics, administration, briefing and de-briefing, technical and administrative support and student assessment must all be conducive to enabling students to use the new technology to the full. If they are not, it will fail, no matter how good the material."[144] Similarly "the most important key to the successful integration of technology into the teaching and learning process, and essential for supporting both faculty and student use, is to carefully modify the curriculum to include specific technology appropriate activities. In particular new tasks must target core components of the curriculum rather than represent superficial add-on tasks. The incorporation of specific tasks within the core curriculum has been shown to be a critical link to whether an institution will successfully use technology."[145]

Laurillard's framework provides the shell within which a NVU could be built. It does not, however, provide the fine detail required to finish and equip the building and make it operational. The success of a National Virtual University will depend on the extent to which it is an integrative environment - the way in which the curriculum is re-engineering, the level of staff development provided, and the process of implementation will all help determine the success of the enterprise. Within the new environment, learners will interact with new technologies in a various ways, determined by the nature of the learning task, and their preferred style of learning. These styles will vary considerably, both between and within individual learners, depending on the nature of the task. Modern learning theories emphasis the importance of context and collaboration when integrating technologies in learning.[146] Bates[147] suggests that the resultant learning context will need to include the following:

- Working alone, interacting with learning material (accessed locally and/or remotely).
- Working collaboratively with fellow students at different sites (local and remote) either synchronous or asynchronously.

Adopting the California model, applying the use of new technologies to integrate all programs and activities on a campus based university for delivery, pedagogic support, learning support and management of teaching, financial and administrative functions, results in a new category, a virtual university in which communication and information technologies integrate all university functions and services including:

- teaching, tutoring, and assessment;
- coaching, libraries, academic offices;
- learning materials provision;
- communication, co-operation, group work and social networking;
- all kinds of knowledge and information flows;

with the result that all learners (both those studying conventionally on campus and those using open learning off campus) receive only marginally different learning experiences, and have a maximum of flexibility and independence with individual, personal support and coaching.

However the Californian model has limitations when compared with a NVU. For example, there is no attempt to address the research function of the university within the CVU, or to replicate physical structures which link universities with their business and commercial hinterlands (such as Science Parks or Technology Transfer companies). Moreover, the CVU is separate from, rather than integrated with, other facets of the knowledge economy, and there no attempt to make the CVU part of a local/regional learning community, involving other training providers, or local and regional government. The California Virtual University failed despite the fact that the State Governor won $16 million for online learning, and spent over six million on CVU in particular. By April of 1999, the dream lay in ruins - all that will remain is a listing of online courses and programs offered by other California institutions. CVU's plans for an virtual library and online guidance and counseling service were shelved, and staff were laid off. The failure affected online learning in general, as CVU was seen in some quarters as a model for the future. One of the major problems was that CVU did not actually create online courses - it only catalogues them - it had no design or delivery expenses so that under CVU individual institutions design and deliver their own online courses

Another aspect of the CVU plan, which is worth considering within the Finnish context, is that one of CVU's primary parameters was a partnership between industry and education. Hence Sun Microsystems, Microsoft, Pacific Bell, KPMG Consulting, and International Thomson Publishing were all involved in the venture and it was planned the companies would take over the CVU's computer and telephone systems, and share profits from services such as computer support, pagers and Internet access, however by April 1998, Microsoft had pulled out. A major cause of the failure lay in the way that the CVU was structured. CVU was dependent on the traditional member institutions to provide courses and grant the degrees, as a result it did not have the

were identified as having an important impact on quality with large scale distance education delivery using new technology:[162]

- **Maintenance of Currency of knowledge and skills** is essential in the information age with the explosion of knowledge and the impact on the application of the knowledge. Largeness of scale spreads the responsibility for currency across all the universities involved in a collaborative way.
- **Faculty Support Services** are as essential in distance learning programs as student support services. Small scale learning programs often lack the necessary critical mass of academic staff to make support services efficient.
- **Program Evaluation** is critical to the quality of all academic programs, large scale education programs provide participating universities with the opportunity to draw from the best of evaluation criteria and a critical mass of data to analyse.
- **Library resources -** are essential and more effective and cost efficient in a collaborative multi-campus system where responsibilities can be shared.
- **Marketing and Recruitment** of a critical mass of qualified well-informed students is essential in the success of distance learning courses. Where advertising web pages are accessible to a large audience campuses are motivated to guarantee accuracy and can benefit from a large pooled marketing effort.
- **Student ability** to deal with the technology is enhanced through shared responsibility for the development of training materials and robustness of technical support.
- **Cost effectiveness** requires large numbers of students to be recruited in order for the costs of materials of development to be covered.
- **Faculty Training and development** required to deal with the use of new technology can best be developed and delivered in a highly collaborative multi-campus project.
- **Long range planning, budget and policy development-** for such a large and innovative project are best undertaken in a collaborative environment.
- **Interaction between staff and students -** is essential to the success of distance provision and minimisation of student drop out, the communication system must ensure that distance students are not isolated but staff are not overwhelmed by messages from students.
- **Faculty responsibility for the educational process -** the technology must ensure that faculty remain responsible for quality assurance within academic programmes.
- **Choice of Technology -** is crucial to all virtual university projects, multiple media to enable many learning choices and the ability for computer mediated communication between faculty and students is paramount.
- **Student assessment -** has a tendency to become fragmented and uncoordinated.

- As an 'apprentice' or 'student' working with a more experienced supervisor or instructor.
- As an instructor or supervisor working with (and for) less experienced colleagues.

Within this learning context, an array of material will be needed in various formats, to address the learning styles of the students and the particular task. As Sumner and Taylor[148] suggest, the approach should be that of media complementarity with the use of multiple media, ***rather than*** multi-media. In their study of the problem of combining online and offline learning within a homogenous environment, Nemirovski et al agree that the World Wide Web creates a new starting point which "keeps the advantages of conventional CBT courseware, and at the same time succeeds in overcoming its restrictions."[149] However, they note that there are various models of online universities and virtual learning environments, each using a different concept, and this absence of a common approach makes it difficult for academic staff seeking to re-engineer existing materials for distance or on-line tuition. This problem is further compounded by the fact that (as Collis notes) "many (outside of faculties of education) may not be aware that there is an extensive base of theory and research related to the science of teaching and learning in higher education and thus can benefit from becoming more aware of certain key principles."[150]

Computer Mediated Communications

The major advance from the use of ITC in teaching is not the delivery of web-based subject content. The functionality of learning packages provided by on-line subject delivery is little different from that provided by CD-Rom. In fact CD-Roms may be more user friendly where the connectivity speed and download time for large files (using video/audio clips or graphics) from the Internet may be prohibitive or disenchanting for on-line learners. Where new technologies are significant is through computer mediated communication, which enables tutors and students to communicate, in real time and asynchronously. Just giving learners the chance to use email or a conferencing system does not guarantee productive or interactive discussion, hence it is necessary for the tutor to initiate the discussion[151] - Kerr emphasises that it is "the nature of the medium" that creates the "need for strong and active leadership" and that "unless a moderator sets an agenda and keeps the group working towards its goal, nothing much will occur."[152] Hence, although the anonymity of web based collaboration can encourage reticent learners,[153] it is usual to require students to provide a minimum number of postings each week.[154] When considering the use of CMC as part of programmes offered to overseas students, one of the major advantages reported is that "text based media … facilitate interaction for those using their second language. … (as) ... Most people are more able to write than speak in another language."[155] Lack of

confidence by students in their pronunciation of a second language is no barrier to interaction when it occurs in written form, rather than verbally and orally.

Re-styling the process of tutorial support presents the greatest challenge to academic staff, as they construct curricula to take advantage of new technology.[156] As Bates acknowledges, "it is just as much a challenge to prepare instructors, tutors and students in the design and learning requirements of CMC. Instructors need to develop skills in identifying the role and purpose of discussion, criteria for assessing the quality of discussion, skills in helping students to participate constructively, and the ability to construct an integrated curriculum that combines CMC with other media."[157] However, Mason comments that "Most teachers who take on the challenge of teleconferencing, particularly those who develop collaborative learning strategies for their courses, report tremendous satisfaction … The reward lies in their sense of working towards the goal of developing independent questioning learners. Almost all find that using these technologies is a tremendous learning experience for themselves."[158]

Summary

Although there are risks and costs as well as benefits from investing in a National Virtual University, the rationale for moving towards use of new information technologies in higher education is well established at both within individual h.e. institutions, and at national level.

Additionally, undertaking the virtual university project at national level enables benefits other than the purely educational to be gained, more particularly the creation of a knowledge based economy, the promotion of social cohesion, the protection of the existing Finnish university system, and the preservation of language and culture.

Within any NVU, the new mode of delivery requires a quantum leap rather than an incremental step in the design and development of a new teaching and learning methodology, which is discursive, adaptive, interactive and reflective.

Although the development of web-based learning packages will take place within the NVU, the major development within the new instructional mode is the use of information and communication technologies to enable learners and tutors to communicate with each other, and it is the change in the nature of the supportive role of staff, through computer mediated communication, that will be crucial in the development and success of the NVU.

First, they are largely American, rather than European or world-wide. Although there may be other providers elsewhere, it is significant that Robin Mason's recent survey[161] (which was initially conducted on behalf of her employer, the UK Open University) did not highlight any serious contenders. The Global Virtual University Alliance may be the only European contender, and is still in the planning stage, but over the next decade the European Open Universities will either join the proposed Global Virtual University Alliance or some similar provider. Secondly, very few (if any) of these providers have yet managed the transformation into collaborative global providers of joint- accredited degrees. Although this will be much harder to achieve, it is here, in providing wider students choice, that greatest gains may be made.

In essence "gateway" sites offer faster access to existing programmes, rather than access to new cross institutional programmes. Compared with what a Finnish NVU project might offer, the competitors are weak as they are both predominantly American based, and are largely catalogue websites only. However, they have the benefit of having got to the market first, developed critical mass, and got company sponsorship. The likely response of competitors to a Finnish NVU project would be to try to develop critical mass by signing up other providers worldwide, but this would require substantial alteration in their product focus – given that most of them emphasise their geographical location and area of operations (e.g. "Western", "California", "Colorado"). The difference with the Finnish NVU is that it could be globally based, and could lead to cross curricula and multi-institutional programs. In the longer term, competition between the Finnish NVU and other European NVUs may be stronger, given that cross national collaboration already exists (between, for example, the German speaking states), and that funding from the European Commission may be available.

Lessons from Previous Virtual Universities

The apparent shortcomings and deficiencies of previous virtual university models, and failures of previous attempts to build virtual universities elsewhere indicate both the extremely high economic and political costs of making mistakes and, by extension, the need to consider very carefully what the NVU should include and how it should be constructed. The California Virtual University (CVU) was one of the earliest, and has become possibly the best known. The CVU Design Office conducted an audit of h.e. institutions in the State and received data from 154 campuses, covering 1,468 individual courses with 51,262 students. Clearly the scale of this operation is such that it provides a useful exemplar for a national virtual university. Hence data from the construction of the California Virtual University provides a useful comparative lesson for constructing a Finnish NVU. The starting point and major factor in the design of CVU was ensuring high quality of provision in spite of the large scale of operation. The following factors

- **National Government:** with whom political priorities (such as retaining power) are often paramount;
- **Government agencies**: who need to consider integration with other (possibly competing) policy priorities, and will be required to create implementation structures;
- **Business Communities**: who may have existing research collaboration with universities and be asked to invest in virtual universities and may also have corporate university aspirations;
- **Higher Education Providers**: who may consider a national virtual university as a threat to their research and teaching functions, student numbers and income streams;
- **Academic Staff Trade Unions**: who may see national virtual universities as threat to staff by changing their functions or even replacing them;
- **Students**: who may view on-line delivery as a cheaper but less satisfying way of learning.

These considerations suggest an incremental approach to the project, starting with an extension in Open University activities, then moving towards a nationally linked unit, before finally extending the service outward. Such a move would enable staged formative evaluation of the project during its life time, to enable strategic changes to be made, allow early exit from the project if it becomes unviable, and aid cost effectiveness by avoiding the spiraling costs often associated with very large, long timescale public sector projects - in the UK for example, the initial cost of the Channel Tunnel was $9 billion, but the final bill came to $13.5 billion. Hence the initial stage would be to extend the delivery of Open University provision in three complementary directions:

- to all higher education providers, and even into the work place;
- horizontally, by allowing a modular course matrix to enable wider student choice and the development of new inter-disciplinary courses;
- vertically, so that students can get an OU degree, rather than just entry into an existing university, as at present through OU provision.

Universities and nation states alike, seeking to build virtual universities by benchmarking best practice elsewhere, soon discover that although much has been written about introducing new technologies and new learning environments to individual universities, there are few guiding examples for building a virtual university network or a national virtual university. Nevertheless, it is worth looking at what has already been attempted elsewhere, in terms of identifying best practice, and assessing the likely competition. There are already electronic online College "gateways", which will act as competitors for the project, and Appendix 2 contains a "thumbnail sketch" of the main competitors. Two things are notable about these.

5 Possible Structures for a National Virtual University

Building on Existing Strengths

On the basis of the previous analysis of the Finnish situation and the rationale for a NVU, it is possible to examine the structures which could be included in a Finnish National Virtual University. The diagram in Appendix 1 provides an initial estimation as to the basic bones of such a structure, which is built upon, and derived from, the existing pattern of Finnish higher education provision. Clearly, in the initial stage not all of the proposed functions will be available. However, to maximise both the integrative aspects of the various functions which a national virtual university could provide, and the available outputs from such a development, it is necessary to consider all desired final elements at the initial stage. Hence the final diagram includes:

- a Virtual Science Park;
- an Electronic Library;
- a Careers Advice Service;
- local government and community learning links;
- links with business;
- on line shopping such as an academic book shop;
- social facilities - an on-line, virtual sports arena (with video games) or even a virtual sauna (a bulletin board or cyber café in which messages could be left anonymously).

Virtual Science Parks are still in their infancy, but early work demonstrates their potential for encouraging collaboration and technology transfer between universities and business. The first Virtual Science Park was constructed in the UK by a specialist team of computer and social scientists at the University of Leeds to integrate existing disparate activities occurring in key UK universities within a large and well -developed local urban economy, through collaboration with a strong team of industrial partners. The Virtual Science Park is a person-centred desktop computer-based system which includes:

- a structured information model that generates a directory of the resources available in the Science Park (organisations, experts, resources);
- search and browsing systems that allow navigation through the resources of the Science Park and access to an information gateway;
- tools for mining and integrating existing information sources;
- an integrated set of communication tools including desktop-to-desktop video-conferencing;

- a link through World-Wide Web to the Internet;
- document management facilities.[159]

The UK pilot project focused primarily on a locally based economy, but subsequent projects have scaled up the virtual science park in size and scope. The city of the Hague, working within the framework of the INFOCITIES project, co-funded by the European Commission's DG XIII, has initiated A 'Virtual Science Park' that links together firms in one area of the city to stimulate business-to-business electronic commerce and networking. Firms are eligible for subsidised charges for connection, usage, consultancy and training. A mobile demonstrator of the benefits of telematics technologies for local SMEs, is housed in a converted bus (the "Internet Bus"). A journal for SMEs developed in partnership with the local cable company (CASEMA) and a local content supplier (Infothuis) is available over the cable network. Similarly, the City of Barcelona has created NetActiva, the first virtual business incubator in Europe, in which a technological platform of contents and services for new businesses and SMEs form an interactive virtual business community for the creation of collaborative networks that promote collaboration and innovation.

Work undertaken by Kaukkonen and Nieminen[160] on Finnish technology transfer, points to the perpetual problems faced in a small country like Finland, firstly, in trying to strike a balance between national R&D interests while focusing on international developments in research and development, and secondly, the dilemma of choosing between the selective concentration of resources in areas of key strength and the national belief in equality of opportunity. Further they point to lower levels of collaboration between interdisciplinary (academic) and intersectoral (governmental) arenas, when compared with the links between government and industry and between companies within industrial sectors, both nationally and internationally. Some of these problems could be addressed by a Science Park operating within the Finnish NVU.

Similarly, the National Virtual University project could link information sources for the local community. The cities of Espoo (http://www.espoo.fi/espoo/index.htm), Helsinki (http://www.hel.fi) and Tampere are already part of the Euro Cities Network, and are seen to be pre-eminent in this use of technology. The Local Community area of the NVU could utilise and build on this expertise by providing common information platforms for all the major urban areas in Finland.

The structure of a national virtual university will be determined by the functions it is asked to perform. Clearly a virtual university designed to enable the export of courses across the globe will vary considerably from an institution designed for the home market. Hence the complexity of the structure will increase along a continuum between:

International Virtual University: providing all the features of a national virtual university, but with the potential to link up with global educational suppliers and enable cross-national course sharing, virtual student mobility, and the export of courses overseas.

National Virtual University: a fully wired new national university, able to award degrees and networking all existing higher education institutions with home and work locations, and also linking to other institutions horizontally in the knowledge economy supply chain - i.e. backwards to providing pre-entry information (course entry requirements, APL and APEL, etc.) and forwards to offer post-graduate support (career guidance and counseling, job advertisements), and life long learning with continual professional updating and work-based learning, as well as the University of the Third Age and facilities for those in retirement.

OU On-Line: an extension of existing Open University activities involving new technology, including t.v. and satellite delivery, electronic libraries, but not threatening the core business of conventional campus based universities.

Portal Site: designed as a "shop window" and entry point to existing on-line delivery by conventional universities.

Other considerations will also impact on the structure adopted for a virtual university including:

Cost - the cost of building a fully operational international virtual university may be either too large a fiscal burden, or too risky an enterprise. It is worth noting that the California Virtual University went bankrupt, while Western Governor's University (with which the UK OU was involved) experienced severe problems despite very large financial resources;

Flexibility - the rate of change of new technology is such that any plan to build a large organisation on the basis of existing technology is bound to require substantial revision before it is completed;

Existing delivery configurations - geographical, demographic and socio economic features may make it too costly to provide virtual university provision across an entire nation state, especially if there is low demand for courses in sparsely populated areas, or if the ICT infrastructure is too costly to install. Additionally, the need for real (rather than virtual) facilities for students, may make it more cost effective to cluster activities around existing learning providers (groups of universities and/or polytechnics) to create learning communities.

Stakeholder Concerns - to successfully build a national virtual university will require that all stakeholder groups are fully consulted, and there is a consensus over the structure, and speed and mode of implementation. The stakeholder groups for a national virtual university will include:

	Southern Regional	University of Phoenix	Western Governors University
Created by/year	SREB-states/1997	business/1990	14 Governors/1996
Number of states	16	national	18
Organization type	non-profit	for-profit	non-profit
Virtual degree granting?	no	yes	yes
Course & degree providers	existing institutions	self	existing
Level of degrees	AA/AS/B/M/D	Cert/AA/B/M	Cert/AA/AAS/B/M/D
Cert./AA/AS-AAS/B/M/D	0/1/6/6/7/0	0/1/0/6/6/0	1/1/1/0/0/0
Courses credit/noncredit	1000+/0	175+/64	193/1
Students now/projected	unknown	3,750/53% growth	10/10,000
Institutions now/future	100+	1	21/business
Community colleges/univ./both	both	NA	both
Public only, or public/private	public/private	NA	public/private/bus.
Operational/planning	operational	operational	operational
Projected/actual start date	Spring 1998	1990	September 1998
Cost to join	no	NA	$100,000/state+center
$ per student/course/program	0/$?/$?	NA	$30/$1-200/$500-1,000
Self-supporting?	yes/$?	yes	yes
Competency based?	no	no	yes
Technologies used	multiple	internet	multiple
Tuition differential	by state/institution	yes	yes
Web/print catalogs	yes/no	yes/yes	yes/no
Info collection/dissemination	yes	yes	yes
Comprehensive library services	no	yes, some	no
Multi-inst. online admissions app?	no	NA	yes
Online admissions	by institution	yes	yes
Electronic payment	no	yes	yes
Open entry-exit/alt. Calendar	some	some	some
Bookstore services	no	yes	yes
Corporate/business partners?	no	no	yes
Faculty/staff training	no	yes	no
Seek grants?	yes	yes	yes
$ Course/program development?	no	yes	yes
Copyright/int. prop. Policy?	no (by inst.)	yes	no (by inst.)
Advising/career counseling?	no (by inst.)	yes	yes (at centers)
Online student/financial aid	no	no	yes

Responding to the Vision of the Information Society: First Steps Towards a National Virtual University

A Policy Discussion Paper

Terence Karran and Juha Pohjonen

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Oulu 2000

Comparative Features of Selected Virtual Colleges and Universities in USA

Feature	Florida Virtual	California Virtual	Colorado Electronic	Kentucky Campus
Created by/year	1999	Gov.-Legis./1997	CC system/1996	Gov-Legis./1997
Number of states	1	1	1	1
Organization type	SUS/SBCC Center	non-profit	CC system	higher ed. board
Virtual degree granting?	no	no	no	no/future ?
Course & degree providers	existing institutions	existing institutions	existing institutions	existing institutions
Level of degrees	Cert/AA/AAS/AS/B/M/D	Cert/AA/AS/B/M/D	Cert/AA/AAS	Cert/AA/AS/B/M/D
# Cert./AA/AS-AAS/B/M/D	TBD	33/10/9/14/33/6	0/1/1/0/0/0	0/0/0/0/0/0
# Courses credit/noncredit	1,900/?	1,600+/0	49/unknown	0/0
# Students now/projected	60,000+/66,000	50,000+/unknown	950/ 30%/yr	0/unknown
# Institutions now/future	38/+ privates	100+	12	27+privates
Community colleges/univ./both	both	both	community colleges	both
Public only, or public/private	public/privates future?	public/private	public	public/private
Operational/planning	planning	operational	operational	planning
Projected/actual start date	Fall 1999	1998	1996	1999
Cost to join	no	$3,500-11,000/inst.	no	no
$ per student/ course/program	0/0/0	0/0/0($ transaction?)	0/0/0	25% tuition?/0/0
Self-supporting?	state supported start	yes	no	no
Competency based?	no	no	no	yes
Technologies used	multiple	multiple	TV/Web	multiple
Tuition differential	by institution	by institution	no	unknown
Web/print catalogs	yes/no	yes/no	yes/yes	yes/yes
Info collection/dissemination	yes	yes	yes	yes
Comprehensive library services	yes/DLLI	yes	yes	yes
Multi-inst. online admissions app?	yes/FACTS	no	NA	yes
Online admissions	by institution	by institution	yes	yes
Electronic payment	yes	no	no	yes
Open entry-exit/alt. calendar	some	some	some	some
Bookstore services	some	yes	no	yes
Corporate/business partners?	yes	yes	no	yes
Faculty/staff training	yes/limited	yes	yes	yes
Seek grants?	as appropriate	yes	yes	yes
$ course/program development?	by institution	yes	yes	yes
Copyright/int. prop. Policy?	by institution/system	no (by inst.)	yes	no (by inst.)
Advising/career counseling?	yes/FACTS	no (by inst.)	no (by inst.)	yes (by central staff)
Online student/financial aid	yes/FACTS	yes	yes	yes

University of Phoenix

Fully accredited

For profit institution

One of the five largest graduate universities in the country (includes on-site and distance learning enrollments)

Has a seven-year old online service designed for working adults

There are 1,700 students enrolled in online service

Student services by telephone, e-mail, fax-mail, internet web

Grants no tenure, employs 45 full-time faculty and 4500 adjunct faculty (for on-campus and distance learning combined)

Degrees offered by distance learning are:

Bachelors of Science in Business/Administration; Business/Information Systems; Business/Management; Business/Accounting

Masters of Business Administration; Business Administration/Technology Management; Business Administration/Global Management

Master of Arts in Organizational Management

Master of Arts in Education

Master of Nursing

Tuition is $295/credit undergraduate and $325/credit graduate

Has a campus in Orlando

Web site: http://www.uophx.edu/

Where there is no vision, the people perish

(Old Testament, Book of Proverbs, Chapter 29, Verse 18)

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JEC College Connection (formerly Mind Extension University)

Is a creation of Jones Education Company (JEC), owned by Jones Intercable, one of the largest cable television companies in the U.S.

Distributes programs from about 20 colleges and universities (tuition varies by institution)

Glenn Jones, CEO Jones Intercable has also founded International University that is distributed by JEC (tuition:$200/credit undergraduate and $234/credit graduate)

Has created an online network

Programs are delivered via satellite to 90 million homes

Most programs are taped, a few are live

Anecdotal information indicates that enrollments have been small historically

Degrees are granted by participating institutions (MEU is not accredited)

Student services are provided by Jones via toll free telephone number

Web site: http://www.meu.edu/cc/index.html

Colorado Electronic Community College

Was created in 1995 by the Colorado Community College and Occupational Educational System

Its purpose is to offer associate degrees through distance learning technology

Students interact with faculty over the Internet and through voice mail boxes

They are building a video and multimedia production and training facility

First classes were offered in Fall 1995

Currently offering fifteen courses per semester

They offer portfolio assessment and award transfer credit

Web site: http://www.cccoes.edu/cccoes/cecc/main.htm

California Virtual University

Will use all mediums and all delivery methods

Will be mostly independent of time and place

First phase: professional degrees and continuing education

Second phase: associate and baccalaureate in general and liberal arts

Involves all higher education in California: the California State System, the University of California System, the California Community College System (all public institutions), Cal Tech, USC and Stanford (private institutions).

It will be open to any California public or private institutions accredited by the Western Association of Schools and Colleges.

Plan to market education globally under the “California” brand name

All courses will be developed by participating colleges and universities

They plan to open the doors of the California Virtual University in October of 1997 with limited offerings (this aggressive roll-out is possible because the public institutions are already offering many courses - for example, the California State System is offering 50 on-line courses for the summer 1997 session)

Tuition costs will be set by each campus, and the market will decide whether the cost is reasonable

State will fund on the same FTE basis as on campus courses

Will not be accredited

Will use a mix of technologies

Three of the issues driving development:

1. Economic development will be fostered

2. Exporting to a global market (public relations and profit)

3. Expanding access in California, dealing with influx of new students, both traditional age and adult learners

Web site: http://www.vudesign.ca.gov/

Contents

Summary Description of the Main Competitors

Western Governors University

The Western Governor's University is a new, public institution

Created by governors June 24, 1996

Addresses concerns about projected increases in student numbers and rising educational cost

Fourteen states and a territory are currently members

It is separately incorporated as a non-profit corporation

Designed to be self-supporting

A tuition split (conjecture has it as a 50%/50%), plus outside funding will fund it

Will be degree-granting and accredited

It will draw on the curriculum and faculty resources of numerous institutions: colleges and universities, private businesses, government, and individuals.

Essential student services will be provided through electronic and other non-traditional means

Learning centers in each state will offer support to students

Will not focus on the number of credits a student has accumulated but rather it will certify the competencies or learning outcomes that the student can document or demonstrate

A student may demonstrate competency in a variety of ways: self-instruction, courses (credit non-credit), military training, apprenticeships or other means

Scheduled to begin offering courses and programs in August, 1997

Will use a mix of all technologies

Web Site: http://www.westgov.org/smart/vu/vu.html

Western Governors University
Website:http://www.wgu.edu
Sponsors: Apple, AT&T, Cisco Systems, Drake Internationa, IBM, ITP, KPMG, Microsoft, Novell, Sloan, Sun Nicrosystem, Sylvan Prometric, 3COM
Universities and Colleges involved

Includes Universities in: Alaska Arizona California Colorado Guam Hawaii Idaho Illinois Montana Nebraska New Mexico North Dakota Oklahoma Oregon Utah Virginia Washington Wyoming

University of Alaska System
Northern Arizona University
Rio Salado College
Colorado Electronic Community College
Regis University
University of Colorado - Boulder
University of Colorado - Denver
University of Guam
University of Hawaii
Idaho Center for Higher Education
Idaho State University
University of Idaho
Fundwell.com
Montana State University
Chadron State College
University of Nebraska - Lincoln
Community College of Southern Nevada
Eastern New Mexico University
North Dakota State College of Science
Oklahoma State University
Eastern Oregon University
Marylhurst University
Dallas County Community College
ITP/Course Technology
Texas Tech University
Brigham Young University
Utah State University
Old Dominion University
Washington City University
Washington State University
University of Wyoming

Executive Summary

1. There is confusion, both in academic circles and the public more generally, about the definition of a virtual university. Hence in considering such an option, it is worth looking more fundamentally at the contexts for higher education, and the functions of a National Virtual University equipped to meet the needs of the 21st Century.
2. The increase in the use of ICT has caused a radical increase in demand for higher education globally, and increased access to higher education via the use of ICT. New suppliers in the form of private and corporate universities, now compete with universities in their home countries, and increasingly, overseas.
3. Although demands for higher education are growing rapidly, analysis of the new and changing demands on universities at local, national and international levels, within an increasingly global knowledge market, indicates that the role of a National Virtual University will be much broader than that of an existing university. Moreover, a NVU will need to successfully compete in an environment which is growing in competitiveness and complexity as corporate universities start to operate, but will have to do so with greater efficiency and lower funding.
4. The socio-economic environment in Finland is characterised by an internationally high (and growing) involvement with information and communication technologies in all spheres of life. Within this fast developing Information Society, there is a high need for increasing skills levels and re-training, especially with respect to ICT. However, like elsewhere in Europe, the use of technology for collaborative teaching in Universities and for promoting joint research with industry, is comparatively underexploited, although the existing higher education platform, provides a useful structure which could adapt to, and benefit from, the establishment of a National Virtual University.
5. The rationale for incorporating the use of new technologies in higher education by building a National Virtual University is well-established. Such a development would require a quantum leap in the design and development of a new learning method. However, in addition to educational benefits, the NVU would aid the creation of a knowledge based economy, the promotion of social cohesion, the protection of the existing Finnish university system, and the preservation of national language and culture.

6. The experience of previous virtual university ventures in the USA demonstrates that collaborative ventures, based on existing providers and reliant on re-engineering of existing teaching and learning practices, are unlikely to be successful, even where they are well financed. A National Virtual University can be constructed with varying degrees of functionality, but where it covers all ranges of university activities (teaching, research and technology transfer), and is well-linked to the local community, the cost of development will be high but the returns on expenditure will be greatest.
7. A project of this size, complexity, cost and importance will only succeed in maximising its potential as a collaborative venture, if it involves all stakeholder groups in discussing its form, as consensus on the form of the NVU will be critical in ensuring the success of its implementation.

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University of Maryland University College
Wor-Wic Community College
Alcorn State University
Delta State University
Mississippi State University
Mississippi University for Women
University of Mississippi
University of Southern Mississippi
Beaufort County Community College
Caldwell Community College & Technical Institute
Carteret Community College
Catawba Valley Community College
Central Piedmont Community College
Cleveland Community College
College of the Albemarle
Craven Community College
Durham Technical Community College
East Carolina University
Edgecombe Community College
Elizabeth City State University
Fayetteville Technical Community College
Forsyth Technical Community College
Gaston College
Guilford Technical Community College
Halifax Community College
Isothermal Community College
Johnston Community College
Lenoir Community College
Mayland Community College
Montgomery Community College
North Carolina State University
Pitt Community College
Randolph Community College
Rowan-Cabarrus Community College
Stanly Community College
University of North Carolina at Chapel Hill
University of North Carolina at Wilmington
Vance-Granville Community College
Wake Technical Community College
Western Carolina University
Western Piedmont Community College
Wilkes Community College

University on line
Website:http://wwwuol.com
Sponsors: Not Known
Universities and Colleges involved

Clemson University
Eastern Michigan University
George Mason University
Georgetown University
Northeastern University
Park College
Regent University
The University of Texas System
University of Toledo
Wichita State University

University of Arkansas
University of Arkansas at Little Rock
Delaware State University
Delaware Technical & Community College
University of Delaware
Brevard Community College
Central Florida Community College
Florida Agricultural & Mechanical University
Florida Atlantic University
Florida Community College
Florida Gulf Coast University
Florida International University
Florida State University
Gulf Coast Community College
Indian River Community College
North Florida Community College
Palm Beach Community College
Santa Fe Community College
Seminole Community College
St. Johns River Community College
St. Petersburg Junior College
Tallahassee Community College
University of Central Florida
University of Florida
University of North Florida
University of South Florida
University of West Florida
Valencia Community College
Armstrong Atlantic State University
Athens Area Technical Institute
Clayton College & State University
Columbus State University
Darton College
East Georgia College
Gainesville College
Georgia College & State University
Georgia Institute of Technology
Georgia Perimeter College
Georgia Southern University
Georgia Southwestern State University
Southern Polytechnic State University
State University of West Georgia
University of Georgia
Valdosta State University
Eastern Kentucky University
Lexington Community College
Morehead State University
Murray State University
Paducah Community College
University of Kentucky
University of Louisville
Western Kentucky University
Bossier Parish Community College
Grambling State University
Louisiana Tech University
Northeast Louisiana University
Northwestern State University of Louisiana
Southeastern Louisiana University
Charles County Community College
Community College of Baltimore, Catonsville
Community College of Baltimore, Essex
Essex Community College
Frostburg State University
University of Baltimore

1. Introduction and Rationale

The *National Strategy for Education, Training and Research in the Information Society for 2000-2004*, issued in 1999 by the Finnish Ministry of Education has the following vision:

> "By the year 2004 Finland will be one of the leading interactive knowledge societies. Success will be based on citizens' equal opportunities to study and develop their own intellectual capacity and extensively utilise information resources and educational services. A high-quality, ethically and economically sustainable mode of operation in network-based teaching and research will have been established"[1]

As the *Higher Education Policy in Finland* paper (published the previous year) makes clear, the university sector is a major driver with a central responsibility for helping to deliver this vision, viz.: "Education and research are crucial to Finland's strategy for the future, which aims at the well-being of its citizens, cultural diversity, sustainable development and prosperity."[2] The same document highlights the ***nationwide virtual open university*** project (www.avoinyliopisto.fi) which it defines as "a system of open university teaching and associated services offered through electronic technology" and describes it as "a channel to a new type of co-operation between universities and to a competitive situation which benefits all parties. … The virtual open university does not seek to take the place of existing teaching systems, but forms an integral component of the overall provision of university education. … (and) … The virtual open university is also a step towards a new learning society."[3] However the more recent policy document, after indicating that "Virtual university education is based on the principles of open and distance learning" specifies as a policy objective that "A multidisciplinary virtual university will be established to produce and transmit high-quality educational services and network-oriented research. The network will include the services offered by the virtual open university."[4]

Research already undertaken[5] demonstrates that most virtual university projects elsewhere in Europe differ from the Finnish project, in being developed at individual university level, rather than through a collaborative national project. The decision for a nationwide approach to the use of new technologies in higher education, rather than allowing individual universities to produce similar parallel and competing projects, is laudable and fiscally prudent, as it:

- reduces wasteful duplication, enables economies of scale, concentrates resources to produce critical mass, and thereby maximises the return on scarce public finances, at a time when government taxation and spending levels are politically sensitive.
- ensures that all universities can (and will) become involved, which increases the connectivity of the resultant network, enabling the possibility of benchmarking best practice between the partners and further raising the individual and composite value of the project to them.

- addresses and reinforces other national objectives, such as cost effectiveness and equality of opportunity by recognising that "Because of the long distances and small population, educational establishments in Finland are relatively small and scattered far from each other. This increases the cost of education … It is time to incorporate the numerous virtual study projects of individual universities and researcher networks into a nationwide network to strengthen networking in research."[6]
- enables collaboration between:
  - same subject departments across the h.e. sector;
  - different subject departments within individual institutions and across the h.e. sector;
  - the higher education and business sectors, in the areas of both research and training.
- places overall project administration at Ministerial level (rather than with a single university), both emphasising the national significance of the project, and enabling a quasi-commercial approach to project management, quality monitoring, and formative and summative evaluation, which together should improve the chances of success for the project.

The project is also a clear demonstration of national self-confidence, strategic foresight and political commitment, both within Finland, and externally to the rest of Europe. However, from the descriptions provided in the policy documents presented above, it is difficult to decide whether the ***multidisciplinary virtual university*** is the same as, or different from, the ***virtual open university,*** more especially as the latter will be included in the former, while both are to be based on the principle of open learning.

However, such a lack of clarity is not unusual when describing new virtual organisations. For example, the recent UNESCO World Conference on *Higher Education in the 21st Century* reported that "The large number of different terms and expressions used in the context of distance or virtual education warrants semantic examination so that they can be classified, misunderstandings can be avoided and the major past and future trends highlighted."[7] Similarly, Glenn Farrell's study of the development of virtual education (based on 10 regional reports) admitted that "The label virtual is widely and indiscriminately used around the globe. Indeed it is frequently used interchangeably with other labels such as open and distance learning, distributed learning, networked learning, Web-based learning, and computer learning," but found that "in spite of the increased use of the term virtual, there are very few examples of institutions using information and communications technologies to carry out all the functions."[8]

In addition, university staff have a personal and vested interest in determining how universities will develop in the future. The nature of the work undertaken by

Hudson Valley Community College
Schenectady County
Community College
Ulster County Community College
Mohawk Valley
Community College
University Colleges of Technology - Alfred,Canton, Cobleskill, Delhi, Morrisville
SUNY Office of Advanced Learning & Information Services
Monroe Community College
SUNY Utica Rome
SUNY Center for Learning and Technology
Tompkins Cortland Community College
SUNY Oneonta
Alfred P. Sloan Foundation
Westchester Community College
University at Stony Brook
Cayuga Community College

Name:Pennsylvania Virtual University
Website:http://business.ship.edu/vu/
Sponsors: None
Universities and Colleges involved
Millersville University,
Shippensburg University,
West Chester University

Name: Southern Regional Electronic Campus
Website: http://www.srec.sreb.org/
Sponsors: None
Universities and Colleges involved
Cover universities and colleges in Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, and North Carolina

Alabama Agricultural and Mechanical University
Auburn University
Bevill State Community College
Calhoun Community College
Central Alabama Community College
Gadsden State Community College
George Corley Wallace State Community College
Jacksonville State University
Jefferson State Community College
Lawson State Community College
Samford University
Troy State University
Troy State University Montgomery
U.S. Sports Academy
University of Alabama
University of North Alabama
Arkansas Technical University
Southern Arkansas University Tech.

Massachusetts: Distance Learning Honors Courses
Website: http://www.umass.edu/pubaffs/dislearn/fac_part.html
Sponsors: None
Universities and Colleges involved

Berkshire Community College,Bridgewater State College, Holyoke Community College, UMass Boston, UMass Amherst, UMass Lowell	Environmental Issues in Massachusetts
Cape Cod Community College, Holyoke Community College, Massasoit Community College, Quinsigamond Community College, UMass Amherst, UMass Dartmouth, Middlesex Community College,	Poets in Massachusetts
Bristol Community College, Mt. Wachusetts Community College, Fitchburg State College, Worcester State College, UMass Lowell, Bristol Community College,	Ethnicity in Massachusetts
Middlesex Community College, Massachusetts Bay Community College, Westfield State College, Framingham State College, UMass Amherst,	Business and Economic Issues in Massachusetts

New York State University
Website: http://sln1.suny.edu/sln
Sponsors: Alfred P. Sloan Foundation
Universities and Colleges involved

State University of New York
University at Buffalo
Binghamton University
SUNY Old Westbury
SUNY Empire State College
University at Albany
New York State College of Ceramics
SUNY Plattsburgh
SUNY New Paltz
SUNY Purchase
SUNY Cortland
Finger Lakes Community College
Columbia-Greene Community College
SUNY Oswego
SUNY Farmingdale
Genesee Community College
Dutchess County Community College
SUNY Environmental Sciences & Forestry
Fashion Institute of Technology
Niagara County Community College
Orange County Community College
Broome County Community College
SUNY Fredonia
Rockland County Community College
Herkimer County Community College
Jamestown Community College
Sullivan County Community College

academics revolves around identification, measurement, categorisation and analysis of physical and social phenomena, and their interest is more especially stimulated when the entity under consideration is the university itself, not least because they have a vested interest in affecting the speed and direction in which it may evolve – as the US President F.D Roosevelt observed, “it is easier to move a cemetery than change a university curriculum.”

Consequently, when considering the construction of a national virtual university, there are valid reasons not to adopt a approach which has as it’s starting point an attempt at definition, namely:

Invalidity of models in the face of technological change - the technology inherent in current models of virtual organisations is developing at an acceleratory pace, which quickly can make such models invalid. Current thinking about virtual universities centres around the World Wide Web as the delivery tool, with the desk-top personal computer as the recipient, and Microsoft products as the display and communication platform. Hence the growth of p.c. usage and the attempt to physically “wire-up” the nation state are seen as important building blocks for creating virtual universities. However, R and D projects such as Bluetooth (in which Nokia has a major role) and the development of WAP (Wireless Application Protocol) will mean that new mobile devices (rather than PCs) will be able to gain access to the internet through a “microbrowser” displaying web pages which are specially formatted for tiny screens, and the cables that currently tie PCs together will be replaced by short-wave radio links. Similarly, interactive t.v. will remove the need for a personal computer to gain access to the internet and the world wide web.

The constraint of definitions - creative thinking about new educational organisations may be constrained rather than improved by focusing on existing definitions of virtual universities, especially when the definitions are very loose. The organisation which meets the needs for new learning environments in Finland might not properly be described as a “university” - virtual or otherwise.

The construction of a radically different organisation is being considered because the arrival of the knowledge based economy and the information society have totally altered the expected roles and responsibilities of conventional universities. Irrespective as to the final title of the proposed project (“Virtual C@mpus”, “On-line university”, etc.), it will both require considerable resources and have significant long term importance for the role of higher education in Finland, and its impact on the economy and society more widely. Moreover, the rapid pace of technological development means that if the project fails, it will become increasingly more expensive to catch up with competitor economies.

Hence:

- the changes in the role and functions of universities, caused by the needs and demands of the fast emerging knowledge society;

- the large commitment in fiscal and manpower resources, required by the project, and the high political and economic cost of failure;
- the centrality of the exercise to future national success, within the knowledge based economy;
- the fact that it is a flagship project (and thus a demonstration of national resolve and competence);

make it sensible to adopt a functional approach, and consider in greater depth the more fundamental nature of university operations.

Moreover, such discussion:

- ensures wide dissemination of the project's ideas;
- enables the concerted knowledge of those involved to be focussed on the project;
- facilitates a consensual approach to the projects goals and objectives, which makes project implementation easier to achieve.

Summary

This discussion paper does not try to provide a fully finished policy framework, but instead hopes to stimulate debate on this important project, which will help determine Finland's standing within both the European higher education arena and, more crucially, the emerging global knowledge economy. Within such an approach, the following question provides a useful starting point:

How should the Finnish national virtual university (NVU) be configured and constructed (in terms of aims and objectives, structure and functions, management and operation, teaching and learning environments, products and services), to develop the skills/ability, knowledge/expertise, capacity/size of the higher education sector, so that it can:

- *exploit areas of national strength and competitive advantage;*
- *address the social and economic challenges of the information society, and thereby*
- *maximise national prosperity and individual fulfilment?*

The following questions arise from this:

- *What are the International/European/National/Regional contexts for higher education?*
- *What are/should be the functions of a 21st century university, to address the needs of these contexts?*
- *How could a Finnish NVU best undertake these functions, either in conjunction with other universities, or by itself?*

Jones Education
Website: http://www.jec.edu/
Sponsors: Netscape, E-Intershop
Universities and Colleges involved

Jones International University	Masters Business Communication
George Washington University	Masters Education Technology Leadership
University of Colorado Health Science Center	Masters Nursing (MSN)
University of Colorado at Colorado Springs	Masters Business Administration (MBA)
Regis University	Bachelor's Business Administration
Jones International University	Bachelor's Business Communication
California State University, Dominguez Hills	Bachelor's Nursing
Colorado Electronic Community College	Associate Degree: Associate of Arts
Seattle Central Community College	Associate Degree: Associate of Arts
Jones International University	Certificate Program Oral and Written Communication Skills
Jones International University	Certificate Program Communication Technologies
Jones International University	Certificate Program Business Communication Skills
Jones International University	Certificate Program Communication Management
Jones International University	Certificate Program Business Technologies
Jones International University	Certificate Program Advanced Oral and Written Communication Skills
Jones International University	Certificate Program Organizational Communication
Jones International University	Certificate Program Early Reading Instruction

Connecticut State University System
Website: http://www.csu.ctstateu.edu/onlinecsu/
Sponsor: Real Education
Universities and Colleges involved

CSU's four universities are located throughout Connecticut: Central in New Britain, Eastern in Willimantic, Southern in New Haven, and Western in Danbury

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Florida's Campus
Website: http://www.flcampus.org
Sponsor:None
Universities and Colleges involved

10 state universities and 28 community colleges

Indiana College Network
Website: http://www.icn.org
Sponsor: None

Universities and Colleges involved	Ivy Tech State College
Independent Colleges of Indiana	Purdue University
Indiana State University	University of Southern Indiana
Indiana University	Vincennes University

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2 Environmental Analysis

International Context

The 1998 UNESCO World Conference in Paris on *Higher Education in the 21st Century*, marked the culmination of a three year study with preparatory conferences across the globe. The scale and comprehensiveness of this exercise indicates the importance which UNESCO attaches to higher education in the 21st century, and the need to "lay down the fundamental principles for the in-depth reform of higher education systems throughout the world … (to) … promote the transformation of higher education, in its material and virtual manifestations, into an environment for lifelong learning, for cultural debate, for the affirmation and safeguarding of diversities."[9] The UNESCO conference concluded that "The problems of higher education … are one of the great challenges confronting society in the approach to the 21st century. Higher education, for its part, is faced with the challenge of preparing itself to fulfil its mission adequately in a world in transformation and to meet the needs and requirements of 21st century society, which will be a society of knowledge, information and education."[10]

The major factor identified by the UNESCO Conference was the growth in information and communication technologies (ICT). The frequency with which ICT is mentioned, in both popular press and informed debate, has caused complacency about the assumed benefits (or threats) that it constitutes. Hence accurate data is useful to inform the debate, and give a true estimate of the future challenges ICT will create. Twenty years ago, only 50,000 computers existed, while today, that many units are sold every 10 hours around the world. Internet expansion has been even greater - in 1985 there were about 300,000 email users registered worldwide, yet only a decade later the United States alone, accounted for over 80 million users.[11] Accurate figures in such a dynamic rate of growth are problematic, but current 'guesstimates' suggest that the Internet has a user population of between 120-150 million. It took radio 37 years to build an audience of 50 million and television about 15 years to reach the same number of viewers - but it took the World Wide Web just over three years to reach its first 50 million users.[12]

This growth in access has stimulated, and been stimulated by, a growth in provision. There were 100,000 internet host sites in 1989, one million by 1992, close to 10 million by 1995 and, according to *The Internet Society* forecasts, this number is projected to grow to 20 million by the end of 2000.[13] This level of connectivity and information sharing will rise even more steeply as such technologies become further integrated. It is already possible to send and receive email via a mobile phone, and as the technologies of personal computing and digital television (both satellite and terrestrial) merge, these different aspects of information exchange will form a seamless system.

The information age and the knowledge-based economy have altered the demand and supply of higher education. Demand has been characterised by three features:

Increased Level of Demand - knowledge based economies require increasing levels of education and training, which has increased demand for higher education. As Dias [14] reports "between 1970 and 1988, the number of students was multiplied by eight in sub-Saharan Africa, by six in Oriental Asia and in Pacific as in Arab States, by four and half in Latin America and Caribbean, by two in South Asia." Even in the more mature Western European economies, growth in h.e. has been rapid. In Austria, for example, university enrolment increased by 260% between 1970 and 1991. In Portugal the number of students in higher education increased from 80,000 in 1980-81 to 290,000 in 1995/96, while in Finland the goal is for an age participation rate of 60-65% by 2000. The global growth in higher education has been phenomenal over the last few decades. In 1960 world higher education enrolment was only 13 million; in 1970 it was already 28 million; in 1980 the total stood at 51 million, and by 1995 there were 82 million higher education students worldwide.[15] A recent Australian study of future demand for higher education forecast that global demand for higher education places would increase to an estimated 97 million in 2010 and 159 million in 2035.[16] Hence there is every reason to predict that the current trend will continue and the world enrolment total will climb beyond the current unprecedented total.

New types of courses demanded - as knowledge becomes dynamic, and information proliferates in scope and accessibility, an ever-increasing number and proportion of jobs require knowledge and skills of a high order. Technological advance disrupts employment structures, creates personnel needs in new fields and specialisms, alters the qualifications and skills required in new and existing fields, while making other competences redundant. In the new global knowledge economy, sources of advantage such as locality or nearness to market no longer exist. It is the knowledge of a firm's people and the effective management of that knowledge which will be critical to its success. The determinant link between the knowledge base of a company's workforce and its competitiveness was identified at the start of the decade by Professor Lester Thurow (Dean of MIT's Sloan School of Management) who rightly argued that "The education and skills of the workforce will be the key competitive weapon in the twenty-first century. The reason: there is a whole set of technologies coming along that will demand that the average workers … have skills that have not been required in the past. These skills go beyond the narrow duties of doing one's job, to a broad skill set to adapt to new technologies and change in the workplace."[17]

These changes have led companies to demand new skills from graduates, as the U.K.´s Association of Graduate Recruiters notes "The most significant challenge for graduates will be to manage their relationship with work and learning. This requires skills such as negotiating, action-planning and networking, added to qualities like self-awareness and confidence."[18] This shift has been characterised

Common Market of Courses and Institutes
Website: http://www.cic.uiuc.edu/CMCI/cmci_homepage.htm
Sponsors: None
University/College Participants

University of Chicago	University of Minnesota
University of Illinois-Chicago	Northwestern University
University of Illinois-Urbana	Ohio State University
Indiana University	Pennsylvania State University
University of Iowa	Purdue University
University of Michigan	University of Wisconsin-Madison

Community College Distance Learning Network
Website: http://ccdln.rio.maricopa.edu/
Sponsors: None
Community Colleges and Types of Courses

Cuyahoga Community College (Ohio)	General Studies, English, Business, Computer Science
Dallas Community Colleges (Texas)	AA/Transfer, Communications, Social Sciences, Business/Computer, Science/ Math,Humanities
Foothill/DeAnzaColleges(California)	AA/Transfer, General Education, Business/Computer, Language/Creative, Arts, Social Sciences, Career Training
Kern Community College District (California)	AA/Transfer, Career Training, Math/ Science, Professional Develop., Bus/ Computer Studies
Kirkwood Community, College (Iowa),	English/Humanities, Continuing Education , Social Sciences, Business, Math
Miami-Dade, Community College, Virtual College, (Florida)	AA/Transfer, General Education, Business/Education, Career Training, Allied Health, Study Skills/ESOL
Rio Salado College, (Arizona)	General Education, Computer Usage, Business/Management, Career Training
Sinclair Community, College (Ohio)	AA/Transfer, General Studies, Business/ Computer, Engineering Tech, Allied Health

Cuyamaca College
DeAnza College
Diablo Valley College
El Camino College
Evergreen Valley College
Foothill College
Fullerton College
Glendale Community College
Golden West College
Grossmont College
Irvine Valley College
Lake Tahoe Community College
Las Positas College
Long Beach City College
Los Angeles Harbor College
Los Angeles Mission College
Los Angeles Trade-Tech College
Merced College
Mira Costa College
Mission College
Modesto Junior College
Mt. San Antonio College
Ohlone College
Oxnard College
Palomar College
Rio Hondo College
Riverside Community College
Sacramento City College
San Bernardino Valley College
San Diego Mesa College
San Joaquin Delta College
Santa Barbara City College
Santa Monica College
Santa Rosa Junior College
Santiago Canyon College
Shasta College
Solano Community College
Southwestern College
Taft College
Victor Valley College
West Hills College
West Valley College
Yuba College
California Institute of Integral Studies
California School of Professional Psychology
Chapman University
Fielding Institute
Golden Gate University
Hope International University
John F. Kennedy University
Loma Linda University
National University
New College of California
Pacific Oaks College
Pepperdine University
Phillips Graduate Institute
Saybrook Graduate Institute
Stanford University
University of La Verne
Western University of Health Sciences

by Botkin[19] as a shift from maintenance learning (i.e. acquiring an historical body of knowledge required to deal with known recurring events and problems) to dynamic learning (which enables change, restructuring and problem reformulation) – from 'just in case' knowledge to 'just in time' knowledge. This analysis concurs with an OECD study on *The Knowledge-Based Economy*, which shows how computers have codified factual knowledge and made it less necessary for people to possess, with the result that "as access to information becomes easier and less expensive, the skills and competencies relating to the selection and efficient use of information becomes more crucial. Tacit knowledge in the form of skills needed to handle codified knowledge is more important than ever in labour markets. Codified knowledge might be considered as the material to be transformed, and tacit knowledge, particularly know-how, as the tool for handling this material."[20] Hence, increasingly in the future, "the key skill, which will distinguish between individuals within knowledge communities, will be the skill which enables the individual to sift and select the right kind of information from the relevant sources, and make the necessary connections at the right time."[21] As Evans and Nation cogently argue "The increasing sophistication and specialisation of contemporary society, … is producing changes to the ways in which education is used, developed and presented. Lifelong learning, professional development and workplace training have existed for many decades. However, these formerly minor aspects of education are now expanding so rapidly that they constitute an equal or greater proportion of the profiles of many universities and colleges."[22] To cope with this dynamic working environment, students expect universities to equip them with life-long learning skills and provide them with continual high level skills upgrading during their careers.

Personalisation of provision - wider experience of higher education within the population causes students to adopt consumerist attitudes, and an expectation that education should be flexible enough to meet their own career and training needs. Part time students who study while working, are starting to use the regime of business efficiency in which they operate, and the level of customer care they themselves provide, as the benchmarks against which to measure their experience of higher education. Students will expect high cost efficiency and effectiveness from higher education providers, more particularly when they have to pay tuition fees themselves. This demand for flexibility extends beyond the curricula offered by universities, to include entry and exit points, access and accreditation of prior learning, study periods, and modes of delivery. Additionally, diagnostic tools enabling the identification of students preferred learning styles will precipitate a demand for learning materials tailored and related to individual styles, thereby enabling students to maximise the learning they obtain from materials. In the future universities will use "electronic means of communication to provide individualised educational systems capable of giving rapid feedback to persons who are part of a dispersed, heterogeneous student population."[23]

In terms of supply, four features are noteworthy.

Growth of Profit Making Universities **-** a new type of corporate university enterprise is exploiting the growing market for career training and degree programs. In just 20 years, the University of Phoenix has become the largest private American university, delivering business and applied degree programs to over 60,000 students in more than 70 locations in the United States. A recent British study highlighted the "explosion of activity in corporate education, for-profit higher education, on-line delivery and university partnerships in the last five years … (and argued that) … The drivers behind borderless education are strong and can only grow."[24]

Involvement of Business **-** the growing market for higher education and life long learning has attracted the attention of the corporate sector as a producer, rather than consumer, of graduates. The accelerating progress of communications and information technologies has produced a post-industrial knowledge based economy, in which universities are crucially involved in the production and transfer of the central commodity - knowledge itself. As knowledge based private sector industries (computing, pharmaceuticals, electronics, etc.) grow to dominate the economy, they are converging with the conventional established suppliers of knowledge. Consequently, universities have become more entrepreneurial and developed closer industrial links, through (inter alia) science parks specialising in technology transfer from university departments. For example, the Technopolis at Oulu in Finland is owned and run by a consortium which includes the University of Oulu, with the University Rector, Professor Lauri H.J. Lajunen, in the position of Vice Chairman of the Board of Directors.

Simultaneously private sector firms in the knowledge based industries have started to move into the area traditionally occupied by higher education, and set up as providers of education and training, initially on an in-company basis, but with the longer term aim of selling expertise to external customers. This recognition of education as a "product" has lead non-educational corporations to extend their in-house training provision and offer their educational services to the wider public. Already business organisations are setting up "quasi universities", such as the Ford Corporate University, and British Aerospace Virtual University. For example, Arthur Andersen, a global accounting and consulting firm, purchased a former college campus, spent $140 million to renovate it and now expends about 6.5% of its gross revenue for educating its employees.[25] The number of corporate universities has grown from 400 in 1988 to over 1000 in 1998, with over 40% of US *Fortune 500* firms now claiming corporate university status. Although the main interest of these new corporate universities is non-accredited training, almost 40% are interested in granting an accredited degree, usually via a partnership with a higher education institution.[26]

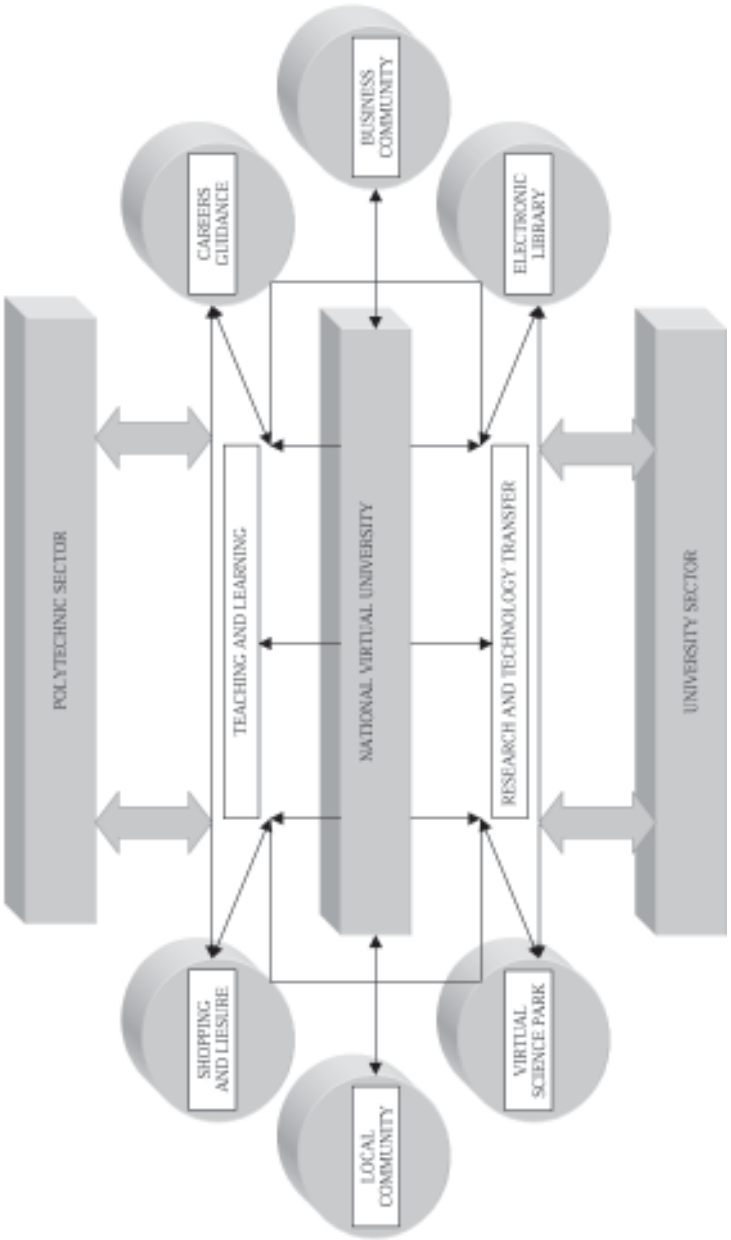
Use of New Technologies for Teaching **-** more institutions (traditional universities, open universities, in-company universities and corporate universities) are using

Appendix 2
Summary of Current Suppliers of Academic "gateway" sites in the USA

California Virtual University
Website: http://www.california.edu
Sponsors: Cisco Systems, International Thomson Publishing, Oracle Corporation, Pacific Bell, Alfred P. Sloan Foundation, Sun Microsystems, Inc.
Universities and Colleges involved

UC Berkeley
UC Davis
UC Irvine
UCLA
UC Riverside
UC Santa Barbara
UC Santa Cruz
Cal Poly Pomona
Cal Poly San Luis Obispo
CSU Bakersfield
CSU Chico
CSU Dominguez Hills
CSU Fresno
CSU Fullerton
CSU Hayward
CSU Long Beach
CSU Los Angeles
CSU Northridge
CSU Sacramento
CSU San Bernardino
CSU San Marcos
CSU Stanislaus
Humboldt State University
San Diego State University
San Francisco State University
San Jose State University
Allan Hancock College
American River College
Antelope Valley College
Bakersfield College
Barstow College
Butte College
Cabrillo College
Cerro Coso Community College
Cerritos College
Chabot College
Citrus College
City College of San Francisco
Coastline Community College
College of Marin
College of San Mateo
College of the Canyons
College of the Desert
College of the Redwoods
College of the Sequoias
College of the Siskiyous
Compton College
Cosumnes River College
Crafton Hills College
Cuesta College

Appendix 1



new technologies for both on-campus students and distance learners. This is in response to demand and expectation, as incoming students are already steeped in the information society, and tomorrow's students will be even better acquainted with new technology.

Hence students will increasingly expect to learn with computers and the latest technology, not least because it is integral to their personal background and experience, and because an increasingly competitive labour market demands ITC skills. In the United States Gubernick and Ebeling,[27] report that there are already 93 'cyberschools', 55% of the 2,215 four year colleges and universities in the USA have courses available off-site and 1 in 7 of US college students are connected to the virtual college classroom. Similarly, Sadlak's recent appraisal of the globalisation of higher education noted that "over 1 million students are now plugged in to the virtual classroom. Estimates indicate that 'cyberstudents' will more than triple in number by the turn of the century."[28] These American developments are now mainstream rather than peripheral, with some of the best known traditional universities offering distance degree programs, including Stanford, the University of Colorado and Harvard, where the Harvard Extension School currently sponsors 580 courses and enrolls 13,500 students annually.[29] A major consequence is that "Increasingly, students who are enrolled at traditional campuses are using distance courses or course modules. These distance courses or academic modules are used by students in the library, as supplements to classroom-based courses, in residence halls and even at home. Distance is rapidly becoming a transparent factor in defining where learning occurs, where instruction originates, or where resources are housed and accessed."[30]

Collaborative Responses in a Competitive Market **-** the growth in the knowledge economy, and the centrality of universities in the development and extension of the knowledge base and the human capital which exploits it, has lead Slaughter and Leslie[31] to coin the phrase 'Academic Capitalism', to describe the activities of contemporary universities. Reviewing these trends, Buchbinder indicates that "the combination of underfunded universities, high tech developments, corporate needs, and the prevailing ideology have lead to a basic transformation in the university: a transformation to a university oriented to the market place,"[32] with the result that, as Abeles starkly observes, "Higher education is now in the global, competitive, marketplace. It is now a client driven environment where individuals are able to choose what they wish to acquire rather than accepting the dictates of institutions."[33] In the 21st century, traditional campus based universities will need to reconfigure themselves to reduce costs, and diversify programs and delivery modes to meet the challenge from other providers of higher education (both universities and corporations), in a fiercely competitive market which is no longer regional or national, but increasingly global.

As Dolence and Norris observe "Society is undergoing a fundamental transformation from the Industrial Age to the Information Age … All people, organisations, societies, and nations are affected, although not all at the same degree. Those who realign their practices most effectively to the Information Age will reap substantial benefits. Those who do not will be replaced or diminished by more nimble competitors."[34] Hence it is evident that "All universities, distance or not, need to become more flexible and responsive to change, whether technological, political, economic or demographic. A more flexibly organised university is a university better equipped to deal with change."[35] Similarly, Tait and Mills argue that in future the major distinction will not be between conventional and distance teaching universities, but "will lie between successful educational institutions using a range of teaching and learning strategies, substantially centred on ICTs and less successful institutions which, as in the industrial and business environment, will be taken over or will go bankrupt."[36]

The commonest response of universities to the challenges of the global market has been collaboration, usually with other universities, but increasingly with other major knowledge centred corporate players. A collaborative response enables a reduction of risk and a sharing of expertise, which means that critical mass (and market entry) can be quickly achieved. Even the larger and well-established providers are acting collaboratively - one of the earliest (and largest) such collaborative organisations has been the Western Governors University. In June 1996, Governors from Arizona, Colorado, Idaho, Nebraska, New Mexico, North Dakota, Oregon, Utah, Washington and Wyoming unanimously endorsed the plan for a new virtual Western Governors University, and were later joined by Alaska, Hawaii, Montana, Nevada, Oklahoma, Texas, Indiana and the territory of Guam. In 1997, Western Governors University signed collaborative agreements with the UK Open University, the Open Learning Agency in British Columbia, the Tokai University Educational System in Japan, and the Universidad Virtual del Instituto Tecnologico y de Estudios Superiores de Monterrey (ITESM) in Mexico.

Robin Mason, reviewing future trends in the global education market, agrees that collaboration is a way out of the dilemma faced by universities but that it is not easy and can take various forms with:

- a complementary partner from a different core business, but which is essential to global provision (e.g. a telecomms provider);
- an educational partner abroad, which has local knowledge but need more content and courses than it can produce locally;
- a consortia of universities, with each partner supplying courses to which all have access;
- international partners to develop courses jointly.

158 Mason, R., (1999), p.43.

159 Drew, R., Dew, P., Morris, D., Leigh, C., Curson, J., (1996), 'The Virtual Science Park', *British Telecommunications Engineering*, Vol.1, No.4, pp.322-329.

160 Kaukkonen, E., and Nieminen, M., (1999), "Modeling the Triple Helix from a Small Country Perspective", *Journal of Technology Transfer*, Vol 24, No.2&3, p.252.

161 Mason, R., (1999), p.15.

162 Vines, D., (April 1998), *California Virtual University: Academic Plan*, mimeo, p.1.

163 *Chronicle of Higher Education*, (2000), 'Enrollment Growth Remains Slow at Western Governors University', 14th January.

164 Berg, G., (1998), 'Public Policy on Distance Learning in Higher Education:California State and Western Governors Association Initiatives', *Education Policy Analysis Archives*, Vol. 6, No. 11.

165 Daniels, Sir John, (1999), 'The Intelligent Use of Technology', lecture delivered at the Telecom Applications Research Alliance, Halifax, Nova Scotia, Canada 12th April.

166 Peters, O., (2000), 'The Transformation of the University into and Institution of Independent Learning', (eds) Evans, T, and Nation, D., *Changing University Teaching: Reflections on Creating Educational Technologies*, (London: Kogan Page), p.20-1.

167 Thompson, D., (1999), 'From Marginal to Mainstream: critical issues in the adoption of information technologies for tertiary teaching and learning', in (eds) Tait, A., and Mills, R., *The Convergence of Distance and Conventional Education*, (London: Routledge) p.154.

168 Florida, R., (1995), 'Towards the Learning Region', *Futures*, Vol. 27, No.5, (1995) p.527-536.

169 Bjarnason, S., Davies, J., Farrington, D., Filden, J., Garrett, R., Lund, H., Middlehurst, R., Schofield, A., (2000), p.39.

170 Ibid, p.24.

of Hypermedia-Based Learning Environments', *Journal of Universal Computing Science*, Vol. 4 No 3, p.292-307.

147 Bates, A., (1995), p.236f.

148 Sumner, T., Taylor, J., (1998), 'New Media, New Practices: Experiences in Open Learning Course Design', *Human Factors in Computing Systems Conference* (CHI'98) Paper (Los Angeles: mimeo), p.4.

149 Nemirovski, G., Huel, E., Hirsekorn, H., Schlageter, G., (1998), 'Combining Online and Offline Learning within a Homogenous Environment', *Online Educa Conference Proceedings*, 4th International Conference on Technology Supported Learning, (Bonn: International Where and How), p.115.

150 Collis, B., (1999), 'Telematics-Supported Education for Traditional Universities in Europe', *Performance Improvement Quarterly*, Vol.12, No.2, p.39.

151 Harasim, L., (1993), 'Collaborating in cyberspace: Using computer conferences as a group learning environment', *Interactive Learning Environments*, Vol. 3, p.119-130.

152 Kerr, E, (1986), 'Electronic Leadership: A Guide to Moderating Online Conferences', *IEEE Transactions on Professional Communications*, Vol. 29 No.1, p.12.

153 McCollum, K., (1997), 'A professor divides his class in two to test value of on-line instruction', *The Chronicle of Higher Education*, Vol.43, No.24, p.23.

154 Paulsen, M., (1995a), 'Moderating educational computer conferences', in Berge, Z., & Collins, M., (eds.) *Computer mediated communication and the online classroom*, (Cresskill, NJ: Hampton Press).

155 Mason, R., (1999), 'The Impact of Telecommunications', in Harry, Keith, (ed) *Higher Education Through Open and Distance Learning*, (London: Routledge) p.34.

156 For a useful summary of some of the issues, see Watt, S., (1995), 'Teaching Through Electronic Mail' *KMI Discussion Paper KMI-TR-39*, (OU: mimeo); Hardy, V., (1992), 'Introducing Computer-Mediated Communications into Participative Management Education: the Impact of the Tutor's Role', *Education and Training Technology International*, Vol. 29, No2, p.325-331; Paulsen, M., (1995b), '*The Online Report on Pedagogical Techniques for Computer-Mediated Communications'*, [WWW document]. http://www.nettskolen.com/alle/forskning/19/cmcped.html

157 Bates, A., (1995), p.216.

In conclusion Mason states "my research leads me to predict incremental changes to universities, some rapid and some fundamental. Closures and amalgamations seem unavoidable, and purely campus-based institutions will become a small and marginalised sector, while international and global institutions, consortia and new providers will dominate the education and training market for life-long learning."[37] This concurs with a recent study of global trends in the virtual delivery of education which found that "we will see the emergence of a relatively small number of institutional providers who will dominate the education market through vast distribution networks and strategic partnerships."[38]

European/National Context

The increasing globalisation of higher education means both 'European' and 'national' contexts have declining significance, but there are developments at both levels which are relevant. Within Europe, there is a growing recognition that higher education must adapt and embrace new information and communication technologies. First, to meet the needs of the workforce which is demanding ever-higher skill levels as the knowledge economy unfolds. Second, to address the threat of corporate universities in the United States using new technologies to 'export' education to Europe. The *Research Agenda* for the EU Information Society Programme noted that "Universities no longer have a monopoly on knowledge. Companies are becoming more aware of the potential of the education market: large companies are already selling courses developed for their internal training needs, while new companies are offering an increasingly wider range of high-tech courses. One of the critical success factors for universities lies in their ability to address the lifelong learning market … universities are competing for the best students and it is very likely that students will take into account the modernity of the learning environment and it's capacity to properly prepare them to work in a global economy. This explains why open and distance learning is one of the most rapidly growing fields in education."[39] The scale of this task is such that "the breadth and depth of research needed cannot be undertaken by small communities of researchers on member states working at the point on intersection between education and computer science. A critical mass of research capacity can only be found at the European Union level."[40]

The 1994 Bangemann Report *Europe and the Global Information Society* recommended the development of lifelong learning for a changing society, and pointed to the need to "Promote distance learning centres providing courseware, training and tuition services tailored for SMEs, large companies and public administrations. Extend advanced distance learning techniques into schools and colleges" and argued for the "Development of a trans-European advanced network (high bandwidth, high definition, carrying interactive multimedia services) linking universities and research centres across Europe, with open access to their libraries."[41] The following year, the EU *White Paper on Education and Training*

argued that the key policy objectives should be "to give everyone access to a broad base of knowledge and to build up their abilities for employment and economic life."[42] More recently, the need to address the impact of changing patterns of higher education demand and delivery across the globe has now been recognised by the European Union, both collectively and in individual nation states. In June 1999 the Education Ministers from 28 European Nations, meeting in Bologna, signed a joint declaration acknowledging "the creation of the European area of higher education as a key way to promote citizens' mobility and employability and the Continent's overall development."[43]

The joint declaration acknowledged the threat posed to higher education in Europe by the potential growth in on-line educational delivery and the subsequent need to "look at the objective of increasing the international competitiveness of the European system of higher education … (through the) adoption of a system of easily readable and comparable degrees, … in order to promote European citizens' employability and the international competitiveness of the European higher education system (and the) promotion of the necessary European dimensions in higher education, particularly with regard to curricular development, inter-institutional cooperation, mobility schemes and integrated programmes of study, training and research."[44] These developments will be facilitated via the Information Societies Technologies strand under the 5th Framework Programme where (under Strand III.3.2 *The Flexible University*) the objective is "To integrate and demonstrate emerging technologies for the flexible University of the future through large-scale experiments (which) should cover co-operation between institutions in providing advanced facilities to allow learners to follow a personalised mix of courses, virtual learner mobility, and interaction between tutors and learners in new ways."[45]

The dangers to European universities of a policy of inactivity, or slower integration of ICT than has occurred in the USA, have been assessed by Robinson.[46] First, the USA providers, having fully supplied their home market, will try to exploit the EU markets and those in Eastern and Central Europe. Second, as the suppliers would be largely American, this would make European companies and universities little more that sub-contractors. As a result, the specific national needs and cultural diversities of European states would be secondary to financial considerations. Finally, without a strategic pan-European approach, individual states (pre-occupied with a need to develop national educational highways) would be tempted to form alliances with US corporations, in order to secure European market domination.

Universities in mainland Europe are starting to address the challenges of the new global educational environment. Hans Van Ginkel, Vice President of the Association of European Universities, stresses the need for a realistic approach based on collaboration: "No university is powerful enough on its own and can invest that many resources to excel in every field of higher education and research.

Lockwood, F. (ed), *Open and Distance Learning Today*, (London: Routledge) p.8.

131 Van der Brande, L., (1993), *Flexible and Distance Learning*, (New York: John Wiley) p.23.

132 Speake, T., and Powell, J., (14/11/1997), 'The missing link in multimedia', *Times Higher Education Supplement*, Multimedia, p.xii.

133 Ruesser, K., (1995), 'From Cognitive Modeling to the Design of Pedagogical Tools' in Vosniadou, S., de Corte, E., Glaser, R., Madl, H., (eds) *International Perspectives on the Design of Technology-Supported Learning Environments*, (Hillsdale NJ: Lawrence Erlbaum) p.81-103.

134 Thorpe, M., (1995), 'The Challenge Facing Course Design', in Lockwood, F., (ed), *Open and Distance Learning Today*, (London: Routledge) p.176.

135 Brittain, M., Chamber, M., Marriott, P., (1997), 'Design Considerations in the development and delivery of digital learning media', (mimeo) paper presented at the *ED-Media Conference*, Frieburg , Germany.

136 Laurillard, D., (1993), *Rethinking University Teaching: A Framework for the effective use of educational technology*, (London Routledge).

137 Laurillard, D., (1993), p.29, 104.

138 Chambers, M., (1999), 'The efficacy and ethics of using digital multimedia for educational purposes', in Tait, A., and Mills, R., (eds) *The Convergence of Distance and Conventional Education*, (London: Routledge) p.11.

139 Laurillard, D., (1993), p.178.

140 Bates, A., (1995), *Technology, Open Learning and Distance Education*, (London: Routledge,) p.202.

141 Reeves, C., (1997), *A Model of the Effective Dimensions of Interactive Learning on the World Wide Web* (University of Georgia: mimeo) p.3.

142 Daniel, J., (1998), *AAHE Bulletin*, Vol.50, No.9, p.11.

143 Bates, A., (1995), p.204.

144 Laurillard, D., (1993), p.226.

145 Grandgenett, N, Grandgenett, D, Topp, N, Fluckinger, J, Ostler, E, Mortensen, R., (1997), 'Integrating Technology into Teaching and Learning: Three Keys to the Kingdom' *Innovations in Education and Training International*, Vol. 34, No. 4, p.254.

146 Ruokamo, H., Pohjolainen, S., (1998), 'Pedagogical Principles for Evaluation

[114] Pratt, J., (1997), *The Polytechnic Experiment 1965-1992*, (Milton Keynes: OU/SRHE).

[115] Dahllöf, U., Goddard, J., Huttunen, J., O'Brian, C., Román, O., Virtanen, I.,(1998), p.29.

[116] Parjanen, L., (1997), *Open University in Finland*, (Ministry of Education: Helsinki), (trans by V. Mattila), p.19.

[117] Ibid., p.14.

[118] Ibid., p.15..

[119] Langlois, C., (1997), 'Information Technologies and University Teaching, Learning and Research' in Hlavicka, J., & Kveton, K., (eds.), *Proceedings* of Rufis '97 Conference: The Role of the University in the Future Information Society, p.187.

[120] Collis, B., (1999), 'Telematics-Supported Education for Traditional Universities in Europe', *Performance Improvement Quarterly*, Vol.12, No.2, p.39.

[121] McCormack, C., Jones, D., (1998), *Building a Web Based Education System*, (New York: Wiley), p.18-24.

[122] Arbeles, T., (1998), p.607.

[123] Tiffin, J., Rajasingham, L., (1995), *In Search of the Virtual Class: Education in an Information Society*, (London: Routledge) p.166.

[124] Bjarnason, S., Davies, J., Farrington, D., Filden, J., Garrett, R., Lund, H., Middlehurst, R., Schofield, A., (2000), p.14.

[125] As Eino Leino observed in *Suomalaisen Kirjallisuuden Historia* (1910), 'Literature is the country's interpreter. Literature is the nation's mirror. Without literature the nation is like a blind man, like a deaf man.'

[126] Crystal, D., (1999), 'The Death of Language', *Prospect*, November, p.56.

[127] Clark, R., (1984), 'Research on Student Thought Processes During Computer-based Instruction', *Journal of Instructional Development*, Vol.7, No.3, p.3.

[128] Skolnic, M., (1998), 'Higher Education in the 21st Century: Perspectives of an Emerging Body of Literature', *Futures*, Vol.30, No. 7, p.636.

[129] Daniel, Sir J., (1997), Speech delivered at the American Association of Higher Education, National Conference on Higher Education, 'Learning, Technology, and the Way We Work.' Washington DC March 16-19.

[130] Hawkridge, D, (1995), 'The Big Bang Theory in Distance Education' in

So we have to focus on the fields we are really excelling in and to find co-makers, other universities as well as other role players in society … It is this type of networking, the connecting of the best within reach, the linking of university services to societal change, that needs our attention."[47]

Similarly, a recent study undertaken on behalf of the UK Committee of Vice Chancellors and Principals accepted that "The truly mass institutions of high quality in both North America and continental Europe are of a scale of magnitude considerably greater than even the largest British University." As a result, "the huge cost of producing, and maintaining high quality courseware for a global market in the future … (is such that) … Investments in courseware needs are particularly daunting. No university in the UK on its own can possibly find the investment required to produce and maintain high quality courseware in all disciplines and combinations of disciplines, simultaneously."[48] This view was endorsed by an expert report to OECD which lamented the poor quality of learning material on the Internet, and stated that improving the quality of high-tech educational materials requires extensive co-operation and large investments for high-quality on-line learning material production.[49]

In 1996 the National Committee of Inquiry into Higher Education in the UK chaired by Lord Dearing, examined trends in higher education in other European countries and concluded that "in Europe there has been a broad evolution away from 'elite' higher education … (as) … Many of the countries experienced rapid student number growth between 1975 and 1980. After a slowdown in the early 1980s, in most countries the expansion was renewed after 1985."[50] Hence although there has been some variation, all European countries have experienced higher student numbers over the last two decades, and are searching for new ways of teaching to handle the common problems posed by a "massification" of higher education.

Financial pressures have been exerted on students, staff and management within all European universities - in essence all are trying to participate in the higher education learning experience which was established in the immediate post war period, but at a time of much increased usage of higher education, and much lower funding. Turner's analysis of changing patterns of funding higher education in Europe, for example, revealed that "The mechanisms for funding higher education, both teaching and research, have been changing radically in most European countries."[51] However, the impact of funding changes has had a much more differentiated effect than that of increasing student numbers, as the systems of funding vary between (and within) different nations. As the Dearing Report found "the systems of student support differ radically between those based on loan and on grant, and also in the extent of the proportion of student population covered. Many of the systems require evidence of satisfactory academic progress for students to be eligible for support."[52]

The Committee's in-depth cross national study showed that, with the exception of Spain, "none of the countries considered were expecting to change significantly the proportion of GDP which they devote to higher education."[53] Hence, most EU nations are raising the numbers of students but keeping funding levels constant, for example in France "Solutions are being sought as to how to secure reasonable per capita funding at a time of rapidly increasing demand for education."[54] Hence the problem that all European Universities are experiencing varies only in depth and intensity, with all looking for new ways to address this problem.[55] A cross national study by Jean-Paul de Gaudemar for the French Ministry of Research and Higher Education found that "in all OECD countries … mass tertiary education, the growing amount of public spending and the corresponding expansion in the siting of institutions has fused the two issues: the issue of equal access has quickly been joined by the issue of external impact on local development,"[56] leading him to stress that "it is vital to bring together education providers and employers at different territorial levels on an organised and permanent basis."[57]

In essence, the severity of the problems experienced varies between different European nations, but all universities are coming under increasing pressure. As Olli-Pekka Heinonen (the former Finnish Minister of Education and Science) observed "Institutions of higher education are in a cross fire of expectations. They are expected to promote the economy and employment, to provide solutions to global environmental problems, to be strong cultural centres, etc. The public at large expect them to solve the burning global, national and regional problems of our times. Young people place their hopes in higher education institutions, expecting to get qualifications which guarantee them a place in tomorrow's society."[58]

Regional/Local Context

At a macro level, universities are helping to develop the idea and reality of a Learning Region within the Learning Economy. Within a learning economy "the success of individuals, firms and regions, reflects the ability to learn; where change is rapid and old skills get obsolete and new skills are in demand; where learning includes skills and the building of competencies, not just increased access to knowledge; where learning is going on in all parts of society, not just high-tech sectors; and where net job creation is in knowledge intensive sectors."[59] The regional impact of the learning economy is widely accepted: "to be effective in this increasingly borderless global economy, regions must be defined by the same criteria and elements which comprise a knowledge-intensive firm … regions must adopt the principles of knowledge creation and continuous learning; they must in effect become knowledge creating or learning regions."[60]

At local/regional level, higher education has moved from being a minor service

93 Finnish Ministry of Trade and Industry, (1999), *White Paper on Industrial Policy (*Helsinki: Ministry of Trade and Industry) mimeo, p.58.

94 Finnish Ministry Of Labour (1999).

95 Pulkkinen, M., (1998), *University Research in Transition: Country Notes for Finland* (Paris: OECD), p.59.

96 Ibid, p.69.

97 Finnish Ministry of Education (1998), p.60.

98 Kaukonen, E., (1997), *The Evaluation of Scientific Research: Selected Experiences*, (Paris: OECD), p.19.

99 OECD (1998), p.75.

100 Numminen, S., (1996), *National Innovation Systems: Pilot Case Study of the Knowledge Power of Finland*, (Paris: OECD) p.28,32,99.

101 Pulkkinen, M., (1998), p.70.

102 Numminen, S., (1996), p.66.

103 Sperling, J., (1999), 'A Business Model of Higher Education in 2025', in M. Thorne (ed), *Universities in the Future*, (London: DTI), p.106.

104 For a comparison of the two approaches, see Karran and Pohjonen (1999).

105 Finnish Ministry of Education, (1999a), p.41f.

106 Ibid., p.55f.

107 Finnish Ministry of Education, (1999b), *Education in Finland,* (Helsinki Ministry of Education), p.26.

108 For information on modular systems, see Watson, D., Brooks, D., Coghill, C., Lindsay,R., Scurry, D., (1989), *Managing the Modular Course: Perspectives from Oxford Polytechnic*, (Milton Keynes: SRHE/OU Press).

109 Finnish Ministry of Education, (1998), p.50.

110 National Committee of Inquiry into Higher Education, (1997b), *Higher Education in the Learning Society*, (London: NICHE), p.133.

111 Sinko, M., Lehtinen, E., (1999), *The Challenges of ICT in Finnish Education*, (Atena: Helsinki) p.124.

112 Haapakorpi, A., (1995), 'The Recession in Finland and the Labour Market for Academic Degree Holders', *European Journal of Education*, Vol.30, No.1, p.108.

113 Finnish Ministry of Education, (1999b), p.24.

[77] SPRU (1996), *The Relationship Between Publicly Funded Basic Research and Economic Performance*, (Brighton, University of Sussex) mimeo, p.24-45.

[78] Henderson, R., Jaffe, A., Trajtenberg, M., (1998), 'Universities as a Source of Commercial Technology: A Detailed Analysis of University Patenting, 1965-1988', *Review of Economics and Statistics*, Vol.80, No.1, p.119-127.

[79] Balazs, K., (1996), 'Academic Entrepreneurs and their Role in Knowledge Transfer', *STEEP Discussion Paper No 37*, (Brighton, University of Sussex) mimeo.

[80] OECD, (1999), *Science, Technology and Industry Scoreboard 1999: Benchmarking Knowledge Based Economies*, (Paris: OECD).

[81] Martin, F., and Trudeau, M., D., (1999), p.58.

[82] OECD, (1998), *University Research in Transition*, (Paris: OECD), p.7f.

[83] Van Ginkel, H., (1995), 'University 2050: The Organisation of Creativity and Innovation', in *Universities in the 21st Century* (ed) Raisman, J., (London: National Commission on Education), p.65-86.

[84] Tavernier, K., (1991), 'Strategic Evaluation in University Management', *Higher Education Management*, Vol.3, No.3, p.259.

[85] Sitra (1998), *Quality of life, Knowledge and Competitiveness*, (Helsinki: Sitra), p.211.

[86] Finnish Ministry of Finance (1999), *Economic Bulletin* 25th November 1999, (Helsinki: Ministry of Finance) p.1,2.

[87] Finnnish Ministry of Finance (1998), *Benchmarking Finland: An Evaluation of Finland's Competitive Strengths and Weaknesses*, (Helsinki: Ministry of Finance).

[88] Mäenpää, K., Luukikainen, S., (1994), *Telecommunications: Clustering, Diversity and Competitiveness*. (Helsinki: Taloustieto Oy), p.96.

[89] Finnish Ministry Of Labour (1999), *Finland's National Action Plan for Employment 1999* [http://www.mol.fi/tpts/nape_part0.html]

[90] Ibid.

[91] Raivola, R., Vuorensyrja, M., (1998), *Osaaminen tietoyhteiskunnassa* (Helsinki: Sitra) p.180.

[92] Markkula, M., Suurla., R, (1998), *Passion to Learn: Benchmarking Good Lifelong Learning Practice*, IACEE Report No 9 (trans Eeva-Liisa Pitkanen) (Helsinki: Cosmoprint OY).

sector to a primary employer, with a central role in urban infrastructure renewal and re-skilling the local workforce. The deindustrialisation during the 1980's lead to the closure of many manufacturing firms, and the proliferation of small knowledge-based enterprises, primarily in the service sector. This, and the growth in student numbers, has meant that universities are often the largest employers in their regions. Few large cities or sub-regions in Europe are now without a university and some have as many as 30-40,000 university students, often with a similar number involved in other forms of post-16 education, leading to their descriptions as "UniverCities"- Paris, for example, has 13 universities with over 330,000 students. The effect of such universities on the local economy is often considerable - for example in 1999 there were more than 13,000 students at the University of Oulu, three-quarters of these coming from the two northernmost provinces of Lapland and Oulu with two-thirds of them finding jobs in this area. Approximately 2,000 new students start their studies each year. The total number of staff is more than 3,000. About 800,000 people live within the university's immediate sphere of influence which encompasses more than half the surface area of Finland. The university's general impact is seen most strongly in the business and cultural life of the area.

A study of the regional impact of universities in Finland[61] identified the interlinked impacts of universities on their hinterlands as follows:

- the direct economic effect through the purchasing power of staff and students (many of whom may be recruited from outside the region), and the associated multiplier effects, for example a cash-flow analysis of the University of Kuopio showed that although the University accounted for only 1.5% of total employment, the direct economic effects amounted to FIM 207 million, while the indirect effects were circa FIM 320 million;[62]
- the positive impact of highly qualified personnel on the region's skills base, allied to the changes in the role and functions of universities, caused by the needs and demands of the fast emerging knowledge society;
- the synergistic interaction between industries and universities, often through formal joint ventures (such as science parks), but also through continued professional updating courses. The growth, scope and performance of science parks developed in Finland by means of collaborative ventures between universities, public companies and local authorities, has been seen as an indicative bench mark of best practice within Europe;[63]
- via social and community developments, through which universities recruit students who are retained in the region after graduation;
- universities have a significant impact on civic activities and cultural life - a finding endorsed by a research study in the UK, *Universities and Communities*[64] which demonstrated that the role of individual universities in the social and

cultural life of their surrounding hinterland is growing and likely to increase.

Hence, the shift in role from minor to major employer following the decline of other industrial sectors, and the growth in the importance of knowledge as a major commodity, has accompanied an entrepreneurial attitude by universities seeking to supplement declining levels of central government funds. Most universities are proactively pursuing a role of partnership and collaboration with a variety of public and private sector organisations - regional offices of central government, county, district and town councils, health authorities, chambers of commerce, enterprise agencies, and industrial and commercial firms. Thus as the study of Eastern Finland universities indicated, "universities have much to offer through locally relevant knowledge production; as gateways to global information resources; in human capital formation through creating a flexible, adaptable workforce and in providing leadership within formal and informal local governance structures."[65] A study for the National Committee of Inquiry into Higher Education in the UK found that "The scope for exploiting the regional and sub-regional benefits of higher education is considerable. In an increasingly competitive global economy there is an evident need to develop higher-level skills, to make provision for lifetime retraining and to capitalise on the application of research findings in product and process innovations. Universities represent a considerable resource to address these challenges."[66]

The Role of Research and Technology Transfer

The opportunities provided by new technologies to facilitate new ways of teaching and learning has meant that the other primary function of universities, research, tends to be over-looked when considering what a virtual university would achieve. This is surprising, given that the World Wide Web was originally created by Tim Berners-Lee to ensure widespread dissemination of results from the international research undertaken at the CERN laboratories. However, the research role of Universities is comparatively recent.[67] The first universities were possibly established within Arabic cultures as teaching institutions - the term "baccalaureate" being derived from the Arabic *bihaqq al-riwaya*, meaning "with the right to teach on the authority of another."[68] The increasing role of research in universities started initially within German universities - in 1809 Humboldt argued that the teacher did not exist just to serve the needs of students but that both have a common role in the pursuit of knowledge.[69] However as late as 1853, Newman contended that "to discover and to teach are distinct functions; they are also distinct gifts, and are not commonly found united in the same person. He, too, who spends his day in dispensing his existing knowledge to all comers is unlikely to have either leisure or energy to acquire new."[70] In the United States too, up until World War II, universities played a relatively minor role in the nation's scientific enterprise. However Roosevelt's perception that the role played by university scientists to help win the war could be extended to provide specific

63 For a cross-European Survey, see Welsh Development Agency (1997), *A Matter of Connections: Links Between development agencies and universities*, (Cardiff: WDA).

64 Goddard, J., Charles, D., Pike, A., Potts, G., Bradley, D., (1994), *Universities and Communities*, (London: CVCP).

65 Dahllöf, U., Goddard, J., Huttunen, J., O'Brian, C., Román, O., Virtanen, I., (1998), p.9.

66 Robson, B., Drake, K., Deas, I., (1997), National Committee of Inquiry into Higher Education, Research Report *9 Higher Education and the Regions*, (London: NICHE) p.186.

67 See Schuller, T., (1995), *The Changing University?* (London, S.R.H.E./O.U. Press).

68 See Leinster-Mackay, D., (1978), 'The idea of a University: A historical perspective on some precepts and practices', *Vestes*, Vol. 20 No. 4, p.28.

69 Humboldt, W., (1970), 'On the spirit and the organisational framework of intellectual institutions in Berlin', *Minerva*, Vol. 8, p.242-267 (original work published 1809).

70 Newman, J.H., (1853), *The Idea of a University*, (NY: Doubleday), p.10.

71 Bush, Vannevar, (1945), *Science The Endless Frontier,* A Report to the President by Vannevar Bush, Director of the Office of Scientific Research and Development, July 1945 (United States Government Printing Office: Washington).

72 For a consideration of these issues see Halsey, A.H., (1992), *Decline of Donnish Dominion: The British Academic Profession in the 20th Century*, (Oxford: Clarendon Press).

73 OECD (1994), *Main Definitions and Conventions for the Measurement of Research and Experimental Development: A Summary of the Frascati Manual* OCDE/GD(94)84, (Paris: OECD), p.7.

74 Massachusetts Technology Collaborative, (1999), *Technology and Economic Growth: The Structure and Performance of Technology-Intensive Industries*, [http://www.mtpc.org/docs/rprtteg1.htm]

75 Martin, F., Trudeau, M., (1998), 'The Economic Impact of University Research', *Research File*, Vol. 2 No. 3, p.1.

76 Martin, F., and Trudeau, M., (1999), 'Measuring the Economic Impact of Universities: Canada' in Gray, H., (ed), *Universities and the Creation of Wealth*, (London: SRHE), p.57.

[47] Van Ginkel, H., (1996), 'Networking and Strategic Alliances: Dynamic Patterns of Organisation and Cooperation' *Journal of the Association of European Universities*, No 109, p.97.

[48] Newby, H., (1999), 'Higher Education in the 21st Century: Some Possible Futures', *Perspectives*, Vol. 3, No. 4, p.110

[49] Leer, A., (1998), 'The Market for Educational Software and Multimedia', Discussion Paper for the OECD *National Expert Meeting on New Developments in Educational Software*, (Paris: mimeo), June 4-5.

[50] National Committee of Inquiry into Higher Education, (1997a), 'Higher Education in Other Countries', *Higher Education in the Learning Society*, (London: NICHE) Appendix 5, p.118.

[51] Turner, D., (1996), 'Changing Patterns of Funding Higher Education in Europe', *Higher Education Management*, Vol. 8 No. 1, p.102.

[52] National Committee of Inquiry into Higher Education, (1997a), p.122.

[53] Ibid.

[54] Ibid., p.31

[55] See for example Wagner, A., (1996), 'Financing Higher Education: New Approaches, New Issues', *Higher Education Management*, Vol. 8, No. 1, (March 1996), p.9-17.

[56] de Gaudemar, J., (1997), 'The Higher Education Institution as a Regional Factor', *Higher Education Management*, Vol.9 No.2, p.54.

[57] Ibid., p.63.

[58] Heinonen, O., (1997), 'What are National Authorities Expecting from Higher Education Institutions?', *Higher Education Management*, Vol. 9 No. 2, p.7.

[59] Goddard, J., (1997), *Universities and Regional Development: An Overview*, OECD Project in the Response of Higher Education to regional needs, (OECD: Paris) p.5.

[60] Florida, R., (1995), 'Towards the Learning Region', *Futures*, Vol. 27, No5, p.532.

[61] Dahllöf, U., Goddard, J., Huttunen, J., O'Brian, C., Román, O., Virtanen, I., (1998), *Towards the Responsive University: The Regional Role of Eastern Finland Universities*, (Helsinki: Edita), p.7f.

[62] Ibid, p.57.

benefits during peacetime, lead to the publication of Vannevar Bush's influential report *Science: The Endless Frontier*,[71] which signaled a major expansion in the role of research universities in the USA. Before this, the American graduate school, with its primary focus on research and higher learning, had grown out of the training of many American scholars in European universities, and an influx of intellectuals into the USA prior to the outbreak of war.

The initial role for research in universities, was conceived in terms of a general public good. Hence academics pursued research solely to extend the boundaries of knowledge, and both in considering new avenues of research, and assessing the outcomes of their work, they were not concerned with the practical application (if any) of research. Similarly, in disseminating their research results through lectures and seminars, minimal consideration was given to whether such knowledge adequately prepared students for their employment after graduation. This ethos, which centred on the absolute freedom of academics to determine the content of studies and the direction of research, was seen as crucial to the idea of university autonomy.[72] Additionally, this emphasis on 'knowledge for the sake of knowledge' lead universities to undertake basic research, and leave the exploitation of the new knowledge which resulted, to commercial firms and businesses. This schism between 'pure' and 'applied' research is acknowledged in the 'Frascati' definition of research drawn up by the OECD which distinguishes between:

- **Basic research** - experimental or theoretical work, undertaken to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any specific application or use in view.
- **Applied research** - also original investigation undertaken to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.
- **Experimental development** - systematic work, drawing on existing knowledge gained from research and/or practical experience, that is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed.[73]

This separation between pure and applied research, and the fact that 'pure' research is undertaken by universities and often requires substantial resources (especially for the natural sciences), caused the allocation of university research funds by national governments to grow substantially. In the USA, for example, more than $20.6 billion ($56 million per day) was spent on academic research in 1993, and universities now account for 12.8% of total R&D. Moreover almost half of the 'basic' research in the US is now undertaken within universities, who commit approximately two thirds of their research budgets to fundamental research, with applied research (26%) and development (8%) making up the remainder.[74] Similarly in Canada, university research sustains $5 billion of GDP and results in

more than 81,000 jobs, which translated into almost one percent of Canada's 1994-95 GDP and more than 0.5 % of all jobs.[75] When increases in national output attributable to the higher productivity of graduates is included, every dollar invested in university R&D in Canada lead to an additional $7.5 in GDP.[76]

In addition to an increase in the stock of knowledge, an analysis conducted for the UK Government on the effect of basic research on economic performance identified:[77]

- **New instrumentation and methodologies** – new research often requires new laboratory tools, some of which have a wider commercial application (the extended use of the World Wide Web, for example, which was originally set up to disseminate research results), or may be utilised by another scientific discipline (as when, for example, X-ray crystallography was used to decipher the DNA double helix).
- **Supply of skilled graduates** - graduates from 'basic' research projects enter industry with advanced levels of training, and membership of international scientific networks.
- **Professional networks** - the importance of fundamental research provides researchers with entry into informal high level cutting edge research communities. Additionally, these networks enable companies to exchange information and personnel with university research teams.
- **Technological Problem Solving** - the results of high level basic research can often have direct implications for industries - as with the growth of the biotechnology and bioengineering industries following the mapping of DNA.
- **Creation of new firms** - there is firm evidence that academics are now much more inclined to seek fiscal rewards for their research through patent registration,[78] but the extent to which university academics create their own companies varies cross-nationally, being more typical in the United States than elsewhere.[79]

Just as the accelerating progress of communications and information technologies has increased the need for new skills and enabled the development of new ways of learning, it has also radically altered the role and operation of university research. During the industrial revolution, universities served few of industry's needs, and kept a deliberate distance from it. However, new technologies have produced a post-industrial knowledge based economy in which universities are now not peripheral but are crucially involved in the production and transfer of the central commodity - knowledge itself. Hence, within the knowledge based economy and the Information Society, the research activities of universities are vital factors in determining economic success. A recent OECD benchmarking study[80] revealed that the knowledge based industries have been outpacing the growth of GDP for many years in virtually all OECD countries. In OECD-wide GDP, the share of

31 Slaughter, S., Leslie, L., (1997), *Academic Capitalism*, (Baltimore and London: John Hopkins University Press).

32 Buchbinder, H., (1993), 'The market oriented university and the changing role of knowledge', *Higher Education*, Vol.26, p.332.

33 Abeles, T., (1998), p.606.

34 Dolence, M., Norris, D., (1995), *Transforming Higher Education: A Vision for Learning in the 21st Century*, (Ann Arbor: Society for College and University Planning), p.2.

35 Vermeer, R., (1999), 'Building tools for flexibility', in (eds) Tait, A., and Mills, R., *The Convergence of Distance and Conventional Education*, (London: Routledge) p.163.

36 Tait, A., and Mills, R., (1999), 'The Convergence of Distance and Conventional Education', in (eds) Tait, A., and Mills, R., *The Convergence of Distance and Conventional Education*, (London: Routledge) p.3.

37 Mason, R., (1998), *Globalising Education: Trends and Applications*, (London: Routledge) p.153.

38 Farrell, G., (1999), *The Development of Virtual Education: A Global Perspective* (Vancouver: The Commonwealth of Learning) p.4.

39 Weets, G., (1998), *Information Society Programme: Research Agenda for Technologies for Knowledge and Skills Acquisition*, (Brussels, EU mimeo) p.7.

40 Ibid., p.1.

41 High Level Group on the Information Society, (1994), *Europe and the Global Information Society* (The Bangemann Report) (Brussels: European Commission), Chapter 4.

42 European Commission (1995), *Teaching and Learning: Towards the Learning Society*, White Paper on Education and Training, (Brussels: E.U), p.9.

43 European Ministers of Education (1999), *The European Higher Education Area*, (Bologna: mimeo) p.1.

44 Ibid, p.2.

45 European Commission, (1999), http://www.echo.lu/ist/ka3/intro.html [WWW document].

46 Robinson, A., (1996), 'Policy Implications for Distance Education in the European Information Society' in Evans, T., and Nation, D., (eds), *The Opening Education: Policies and Practices from Open and Distance Education*, (London: Routledge) p.29.

[17] Thurow, L., (1990), 'The State of American Competitiveness and How it Can Be Improved' speech made at the Xerox Quality Forum II, July31st-August 2nd, Leesburg, Virginia.

[18] Association of Graduate Recruiters, (1995), *Skills for Graduates in the 21st Century*, (Cambridge: A.G.R.), p.5.

[19] Botkin, J., Elmandjra, M., Malitza, M.,(1979), *No Limits to Learning: Bridging the Human Gap*, (Oxford: Pergamon).

[20] OECD (1996), *The Knowledge-Based Economy*, (Paris: OECD), p.13.

[21] Robertson, D., (1999), 'Knowledge Societies, Intellectual Capital, and Economic Growth' in Gray, H., (ed), *Universities and the Creation of Wealth*, (London: SRHE), p.33

[22] Evans, T., and Nation, D., (1996), 'Opening Education: Global lines, local connections' in Evans, T., and Nation, D., (eds), *The Opening Education: Policies and Practices from Open and Distance Education*, (London: Routledge) p.3.

[23] Keegan, D., and Rumble, G., (1982), 'The DTUs: an appraisal', in G. Rumble and K. Harry (eds), *The Distance Teaching Universities*, (London: Croom Helm). p.248.

[24] Bjarnason, S., Davies, J., Farrington, D., Filden, J., Garrett, R., Lund, H., Middlehurst, R., Schofield, A., (2000), *The Business of Borderless Education: UK perspectives: Summary Report*, (London: CVCP) p.10.

[25] Abeles, T., (1998), 'The Academy in a Wired World', *Futures*, Vol.30, No.7, p.604.

[26] Meister, J., (1998), *Corporate Universities: Lessons in Building a World Class Workforce*, (New York: McGraw Hill) p.268, 272.

[27] Gubernick, L., and Ebeling, A., (1997), 'I got my degree via email' *Forbes On-Line*, [WWW document]. http://www.forbes.com/forbes/97/0616/5912084a.htm

[28] Sadlak, J., (1998), 'Globalisation and Concurrent Challenges for Higher Education' in Peter Scott (ed), *The Globalisation of Higher Education*, (London: SRHE) p.103.

[29] McIsaac, M., (1999), 'Distance Learning: The US Version', *Performance Improvement Quarterly*, Vol. 12, No. 2, p.28.

[30] Hall, J., (1996), 'Electronic Technology and the Modern University' in Evans, T., and Nation, D., (eds), *The Opening Education: Policies and Practices from Open and Distance Education*, (London: Routledge) p.12.

this broadly defined group (i.e. high and medium high technology manufacturing industries and services such as finance, insurance and communications) is now more than 50%, up from 45% in 1985, and in all countries, knowledge based services are now the largest sector. Since 1985, knowledge based industries have increased fastest in Korea, Portugal, Australia, the UK, Japan and Finland. Hence information and communication technologies are the major driver of the knowledge based economy, and how universities will use their research capabilities to adopt and master these technologies will determine future national prosperity. Hence "in an age where economic growth is increasingly driven by knowledge generation, … university research activities must be seen as indispensable in a knowledge intensive, globally competitive marketplace."[81]

Universities are having to evolve new roles and configurations to cope with higher student numbers and more diverse learning needs, while simultaneously retaining their commitment to long-term basic research. To try to pinpoint the trends in university research and map out the longer term implications of these changes, the OECD commissioned a major cross national study on *University Research in Transition*. The study identified the following:[82]

- **Declining government R&D finance** – Government research and development (R&D) budgets are falling in OECD countries, causing a leveling off, or decline, in university research funding, so that universities are seeking new sources of support.
- **Changing nature of government finance** – Government research funding is becoming mission-oriented, contract-based and more dependent on output and performance criteria.
- **Increasing industry R&D finance** – Private industry is funding an increasing share of university research, which is leading universities to perform research more directly aimed at potential commercial exploitation.
- **Growing demand for economic relevance** – Universities are under pressure to pursue research which can contribute to the innovation systems of their national economies.
- **Increasing systemic linkages** – Universities are encouraged to enter joint ventures and co-operative research with industry, government facilities, and other research institutions to enhance the effectiveness of networks and feedback loops in national innovation systems.
- **Growing research personnel concerns** – An aging scientific workforce, along with declining interest in some scientific areas by potential entrants, raises concerns about the future availability of well-trained researchers, while the training of researchers is changing.
- **Internationalisation of university research** – Globalisation, resulting from advances in information and communications technologies, is making research

more competitive and leading to specialisation.

- **A changing role** – Universities are seen as essential to the knowledge-based economy, so although the role of universities is changing, no nation will consent to a decline in the research, training or knowledge-transfer capabilities of their higher education systems.

A notable aspect of the changing relationship between universities and businesses has been the development of Science Parks. The first Science Park was set up in San Francisco in 1949 jointly between Stanford University and Helwett Packard. This was followed by the Raleigh Durham Research Triangle in North Carolina involving the State University, Duke University and the University of North Carolina at Chapel Hill. The rapid growth in Science Parks in the 1960's in the USA to over 100, lead to the first Science Parks in Europe in the 1970's such as Heriot-Watt University Research Park in Scotland and ZIRST at Grenoble in France. In the last twenty years the number of Science Parks has increased rapidly, along with the genesis of the technopolis where new towns are formed around one or more Science Parks.

The term 'Science Park' includes initiatives such as Research Parks, Technology Transfer Companies, etc. The objectives of Science Parks normally include the following:

- to encourage and facilitate the formation and growth of new businesses based on the research knowledge and expertise available within a University;
- to act as a catalyst for changes in a region, both in terms of providing new sources of employment in an area of, perhaps, declining traditional industries, and in helping to change the perceptions of the area, showing that it can create, attract and support new forms of industry;
- to build up an established infrastructure of capable, modern subcontracting companies, based initially on the needs and encouragement of the Science Park tenants;
- to act as a mechanism in a regional policy of upgrading the sophistication and added value of existing industries by providing a location in which continuous and close technical support can be given to existing local companies which have purchased licences to manufacture and market products which are new to that region or country;
- to provide a source of income for a University or centre of research to assist the further development of the parent institution, via the sale of services or rental income.

Despite the growth in Science Parks, there has always been a tension between Universities and Commerce. The academic community perceives its primary

Footnotes

1 Finnish Ministry of Education, (1999a), White Paper *Education, Training and Research in the Information Society: A National Strategy for 2000-2004* (Helsinki: Finnish Ministry of Education) p.14.

2 Finnish Ministry of Education, (1998), White Paper *Higher Education Policy in Finland* (Helsinki: Finnish Ministry of Education) p.26.

3 Ibid, p.57.

4 Finnish Ministry of Education, (1999a), p.42.

5 Karran, T., and Pohjonen, J., (1999), 'Towards the Virtual C@mpus: Possibilities, Problems, and Practicalities', EADTU Conference, Milton Keynes, mimeo.

6 Finnish Ministry of Education, (1999a), p.41.

7 Olio, D., (1998), *From Traditional to Virtual: the New Information Technologies*, (UNESCO: mimeo) p.4.

8 Farrell, G., ed., (1999), *The Development of Virtual Education: A Global Perspective*, (Vancouver: The Commonwealth of Learning), p.2f.

9 UNESCO, (1998), *Higher Education in the 21st Century: Vision and Action, Conference Invitation* (UNESCO, mimeo), p.1.

10 UNESCO, (1998), *Higher Education in the 21st Century: Towards an Agenda 21 for Higher Education* (UNESCO: mimeo), p.5.

11 Gladieux, L., and Swail, W., (1999), *The Virtual University and Educational Opportunity,* (Washington: The College Board), p.11.

12 Naughton, J., (1999), 'This is where it's @', *The Observer Review*, 22nd August 1999, p.3.

13 Leiner, B., Cerf, V., Clark, D., Kahn, R., Kleinrock, L., Lynch, D., Postel, J., Roberts, L., Wolff, S., (1997), 'A Brief History of the Internet' *On The Internet*, [WWW document]. http://www.isoc.org/internet/history/brief.html

14 Dias, M., (1994), 'New Trends in Interuniversity Co-operation at Global Level', *Higher Education Managemen*t, Vol. 6 No 1, p.107.

15 UNESCO Divisions of Higher Education and Statistics, (1998), *World Statistical Outlook on Higher Education: 1980-1995* (UNESCO: mimeo), p.6.

16 Bligh, D., (1995), 'International Education: Australia's Potential Demand and Supply', (mimeo) research paper presented to the 1995 *International Education Conference*, Brisbane, October.

Conference Invitation (UNESCO: mimeo).

Van der Brande, L., (1993), *Flexible and Distance Learning*, (New York: John Wiley).

Van Ginkel, H., (1995), 'University 2050: The Organisation of Creativity and Innovation', in *Universities in the 21st Century* (ed) J. Raisman, (London: National Commission on Education), p.65-86.

Van Ginkel, H., (1996), 'Networking and Strategic Alliances: Dynamic Patterns of Organisation and Cooperation' *Journal of the Association of European Universities*, No 109, p.91-106.

Vermeer, R., (1999), 'Building tools for flexibility', in (eds) Tait, A., and Mills, R., *The Convergence of Distance and Conventional Education*, (London: Routledge) p.161-174.

Vines, D., (April 1998), *California Virtual University: Academic Plan*, mimeo.

Wagner, A., (1996), 'Financing Higher Education: New Approaches, New Issues', *Higher Education Management*, Vol. 8, No. 1, p.9-17.

Watson, D., Brooks, D., Coghill, C., Lindsay,R., Scurry, D., (1989), *Managing the Modular Course: Perspectives from Oxford Polytechnic*, (Milton Keynes: SRHE/OU Press).

Watt, S., (1995), 'Teaching Through Electronic Mail' *KMI Discussion Paper KMI-TR-39*, (OU: mimeo).

Weets, G., (1998), *Information Society Programme: Research Agenda for Technologies for Knowledge and Skills Acquisition*, (Brussels, EU mimeo).

Welsh Development Agency (1997), *A Matter of Connections: Links Between development agencies and universities*, (Cardiff: WDA).

research role in terms of:

- pursuing collaborative "basic" research;
- supporting a free exchange of ideas and information that result from research;
- guaranteeing academic freedom to enable objective enquiry;
- upholding the probity of research.

By contrast industrial and commercial companies:

- engage in directed applied research;
- endeavour to maintain the secrecy of industrial ideas and processes through patents and copyrights;
- attempt to defend a competitive market position through patented products.

Hence, until recently, universities were not likely to become involved with applied research with companies, indeed given the conflict of interests outlined above, the outputs from such collaboration were often considered less academically valid. Universities and academics who wished to collaborate with industry often found that they were unable to benefit commercially from their discoveries, because the infrastructure did not exist within academia to support the transfer of university knowledge outputs to the wider community, through the patenting and copyrighting of inventions and discoveries. Additionally, university staff attempting research with industry and business often found that such research was less likely to secure advancement within an academic career structure, where articles in peer reviewed subject journals are viewed more favourably that joint patent applications with companies.

Within the post-industrial knowledge based economy, the position of universities has altered. Instead of being on the periphery of the productive processes in the economy, they are now in the position of being primary producers of the central commodity - new knowledge. ICT speeds up the flow of knowledge and, by extension, the volume of knowledge - even simple changes like email radically alter the way we communicate. Estimates have show that growth in the volume of knowledge is accelerating, the amount of knowledge can now double every five years.[83] Hence ITC has shifted higher education from an elitist service to a marketable product. As Tavernier[84] has observed, because the production of knowledge is no longer location bound, it has become a real factor of production, which can be bought and sold, imported and exported. However unless this commodity is quickly made available to the markets, its utility declines. Hence universities are now involved not only in the process of protecting the access rights to the knowledge products they create (though patents and intellectual property rights), they are also committed to the process of technology transfer.

Summary

In order to address the challenges of operating successfully within the contexts described above, a national virtual university must be able to:

- *cope with a large increase in the demand for higher education, across the globe, in which the dominant languages for tuition will be English, followed by Chinese and Spanish;*
- *provide courses which address the need for new and emerging knowledge sets, and instill not just subject knowledge but interpersonal skills and competence appropriate to, and demanded by, firms operating in increasingly global markets;*
- *enable students to undertake life-long learning, and provide them with professional updating and skills upgrading courses throughout their working lives;*
- *be customer focussed by demonstrating flexibility in respect of individual study programs, entry and exit points and modes of delivery;*
- *compete with newly emerging educational providers, both profit making universities, and corporate training providers;*
- *realise the benefits of collaboration with other universities and partnerships with companies to achieve viability, protect and enhance market share, and have a global reach;*
- *source and secure government and private sector funding to undertake fundamental high level research, jointly with other universities and companies and exploit the results through technology transfer;*
- *undertake a widening portfolio of responsibilities, much broader than the original remit of knowledge creation and transmission, in an increasingly competitive environment, but with greater efficiency and lower funding levels.*

John Hopkins University Press).

Skolnic, M., (1998), 'Higher Education in the 21st Century: Perspectives of an Emerging Body of Literature', *Futures*, Vol.30, No. 7, p.635-650.

Speake, T., and Powell, J., (14/11/1997), 'The missing link in multimedia', *Times Higher Education Supplement*, Multimedia, p.xii.

Sperling, J., (1999), 'A Business Model of Higher Education in 2025', in M. Thorne (ed), *Universities in the Future*, (London: DTI), p.104-119.

SPRU (1996), *The Relationship Between Publicly Funded Basic Research and Economic Performance*, (Brighton, University of Sussex) mimeo.

Sumner, T., Taylor, J., (1998), 'New Media, New Practices: Experiences in Open Learning Course Design', *Human Factors in Computing Systems* Conference (CHI'98) Paper (Los Angeles: mimeo).

Tait, A., and Mills, R., (1999), 'The Convergence of Distance and Conventional Education', in (eds) Tait, A., and Mills, R., *The Convergence of Distance and Conventional Education*, (London: Routledge) p.1-4.

Tavernier, K., (1991), 'Strategic Evaluation in University Management', *Higher Education Management*, (Vol.3, No.3, Nov.1991) p.257-267.

Thompson, D., (1999), 'From Marginal to Mainstream: critical issues in the adoption of information technologies for tertiary teaching and learning', in (eds) Tait, A., and Mills, R., *The Convergence of Distance and Conventional Education*, (London: Routledge) p.150-160.

Thorpe, M., (1995), 'The Challenge Facing Course Design', in Lockwood, F., (ed), *Open and Distance Learning Today*, (London: Routledge) p.175-184.

Thurow, L., (1990), 'The State of American Competitiveness and How it Can Be Improved' speech made at the Xerox Quality Forum II, July31st-August 2nd, Leesburg, Virginia.

Tiffin, J., Rajasingham, L., (1995), *In Search of the Virtual Class: Education in an Information Society*, (London: Routledge).

Turner, D., (1996), 'Changing Patterns of Funding Higher Education in Europe', *Higher Education Management*, Vol. 8 No. 1, p.101-111.

UNESCO Divisions of Higher Education and Statistics, (1998), *World Statistical Outlook on Higher Education: 1980-1995* (UNESCO: mimeo).

UNESCO, (1998), *Higher Education in the 21st Century: Towards an Agenda 21 for Higher Education* (UNESCO: mimeo).

UNESCO, (1998), *Higher Education in the 21st Century: Vision and Action*,

Independent Learning', (eds) Evans, T, and Nation, D., *Changing University Teaching: Reflections on Creating Educational Technologies*, (London: Kogan Page), p.10-23.

Pratt, J., (1997), *The Polytechnic Experiment 1965-1992*, (Milton Keynes: OU/ SRHE).

Pulkkinen, M., (1998), *University Research in Transition: Country Notes for Finland* (Paris OECD).

Raivola, R., Vuorensyrja, M., (1998), *Osaaminen tietoyhteiskunnassa* (Helsinki: Sitra).

Reeves, C,. (1997), 'A Model of the Effective Dimensions of Interactive Learning on the World Wide Web', (University of Georgia: mimeo).

Robertson, D., (1999), 'Knowledge Societies, Intellectual Capital, and Economic Growth' in Gray, H., (ed), *Universities and the Creation of Wealth*, (London: SRHE), p.18-35.

Robinson, A., (1996), 'Policy Implications for Distance Education in the European Information Society' in Evans, T., and Nation, D., (Eds), *The Opening Education: Policies and Practices from Open and Distance Education*, (London: Routledge) p.21-32.

Robson, B., Drake, K., Deas, I., (1997), National Committee of Inquiry into Higher Education, Research Report 9 *Higher Education and the Regions*, (London: NICHE).

Ruesser, K., (1995), 'From Cognitive Modeling to the Design of Pedagogical Tools' in Vosniadou, S., de Corte, E., Glaser, R., Madl, H., (eds) *International Perspectives on the Design of Technology-Supported Learning Environments*, (Hillsdale NJ: Lawrence Erlbaum) p.81-103.

Ruokamo, H., Pohjolainen, S., (1998), 'Pedagogical Principles for Evaluation of Hypermedia-Based Learning Environments', *Journal of Universal Computing Science*, Vol. 4 No 3, p.292-307.

Sadlak, J., (1998), 'Globalisation and Concurrent Challenges for Higher Education' in Scott, P., (ed), *The Globalisation of Higher Education*, (London: SRHE/O.U.Press) p.100-107.

Schuller, T., (1995), *The Changing University?* (London, S.R.H.E./O.U. Press).

Sinko, M., Lehtinen, E., (1999), *The Challenges of ICT in Finnish Education*, (Atena: Helsinki).

Sitra (1998), *Quality of life, Knowledge and Competitiveness*, (Helsinki: Sitra).

Slaughter, S., Leslie, L., (1997), *Academic Capitalism*, (Baltimore and London:

3 The Finnish Environment

The Social and Economic Environment

In addition to meeting the general challenges affecting an international university in the 21st century, the proposed Virtual University will also need to be capable of addressing the specific national needs of Finland. These needs arise from historical economic and social circumstances and the personal aspirations of the people, as expressed via the policy programmes of their elected representatives. The national vision is that "Finnish society should develop and apply in an exemplary, exhaustive and sustainable manner the opportunities offered by the information society so as to improve expertise, international competitiveness, interaction and the quality of life."[85] Clearly, an in-depth longitudinal and cross-sectoral study of the Finnish society and economy is both inappropriate and beyond the scope of this paper. However, any large scale project such as a national virtual university, which fails to take account of the society and economy it is designed to serve, risks the high financial, social and political costs associated with possible failure, more especially where the project forms a major part of the strategy to deliver a knowledge based economy.

The *Economic Bulletin* produced by the Ministry of Finance in September 1999 reported that "Economic prospects in Finland are favourable. Export volumes have picked up since the low volumes of the early months of the year; business expectations have become distinctly positive, and household confidence has also strengthened. Moreover the number of jobs has continued to grow fast. … The number of jobs increased more than anticipated this year, and the labour force shortages are becoming more widespread. Labour demand has been highest in the service industries, construction activities and in the electricity and electronics industries."[86] More significantly, an in-depth bench-marking exercise of Finland's strengths and weaknesses substantiates the nation's economic competitiveness[87] and highlights the growing impact of knowledge based economies, more especially the telecommunications sector which is expected to overtake the forest industry as the country's largest exporter.[88] The impact of telecommunications within the Finnish economy is confirmed by the OECD data shown in table 1 and diagram 1 below. These figures demonstrate that Finland is now among the world's leading knowledge based economies, and is experiencing a very fast rate of growth in this area.

Interwoven within this strategy of greater integration of ITC at home and in the workplace, is a continuing commitment to increasing access to education and training, as a means of improving equality of opportunity and combating sexism, ageism, unemployment and social exclusion, especially among groups particularly at risk. Hence the *National Action Plan for Employment* acknowledges that "Equal educational and training opportunities according to the principle of lifelong learning are the right of every citizen regardless of place of residence, age, sex, language and economic position. Training can help erode the rigid gender divisions

between occupations. Education policy can also help prevent exclusion and deal with the challenges of aging workers."[89] The increased use of ITC can be especially important in enabling people with disabilities to undertake economically useful and personally fulfilling work, and this has been recognised through measures whereby "The access of young people with severe disabilities to working life will be improved, people with disabilities outside the labour market will be encouraged to return to work, and apprenticeship training for people with disabilities on rehabilitation allowance will be promoted."[90] Similarly, education and training strategies are to be developed to address the problems of the established Sami and Roma ethnic minorities within Finland.

Table 1: % Shares of high-technology industries in total manufacturing

	Exports		Value added	
	1970	1993	1970	1994
Australia	2.8	10.3	8.9	12.2
Austria	11.4	18.4	..	..
Belgium	7.2	10.9	..	..
Canada	9.0	13.4	10.2	12.6
Denmark	11.9	18.1	9.3	13.4
Finland	**3.2**	**16.4**	**5.9**	**14.3**
France	14.0	24.2	12.8	18.7
Germany	15.8	21.4	15.3	20.1
Greece	2.4	5.6	..	..
Ireland	11.7	43.6	..	..
Italy	12.7	15.3	13.3	12.9
Japan	20.2	36.7	16.4	22.2
Netherlands	16.0	22.9	15.1	16.8
New Zealand	0.7	4.6	..	5.4
Norway	4.7	10.7	6.6	9.4
Spain	6.1	14.3	..	13.7
Sweden	12.0	21.9	12.8	17.7
United Kingdom	17.1	32.6	16.4	22.2
United States	25.9	37.3	18.2	24.2

Source: OECD, *The Knowledge Based Economy*, (OECD: Paris) p.9

in Other Countries', *Higher Education in the Learning Society*, (London: NICHE) Appendix 5.

National Committee of Inquiry into Higher Education, (1997b), *Higher Education in the Learning Society*, (London: NICHE).

Naughton, J., (1999), 'This is where it's @', *The Observer Review*, 22nd August 1999, p.3.

Nemirovski, G., Huel, E., Hirsekorn, H., Schlageter, G., (1998), 'Combining Online and Offline Learning within a Homogenous Environment', *Online Educa Conference Proceedings*, 4th International Conference on Technology Supported Learning, (Bonn: International Where and How).

Newby, H., (1999), 'Higher Education in the 21st Century: Some Possible Futures', *Perspectives*, Vol. 3, No. 4, 1999 p.106-113.

Newman, J.H., (1853), *The Idea of a University*, (NY: Doubleday).

Numminen, S., (1996), *National Innovation Systems: Pilot Case Study of the Knowledge Power of Finland*, (Paris: OECD).

OECD (1994), *Main Definitions and Conventions for the Measurement of Research and Experimental Development: A Summary of the Frascati Manual* OCDE/GD(94)84, (Paris: OECD).

OECD (1996), *The Knowledge-Based Economy*, (Paris: OECD).

OECD, (1998), *University Research in Transition*, (Paris: OECD).

OECD, (1999), *Science, Technology and Industry Scoreboard 1999: Benchmarking Knowledge Based Economies*, (Paris: OECD).

Olio, D., (1998), *From Traditional to Virtual: the New Information Technologies*, (UNESCO: mimeo).

Parjanen, L., (1997), *Open University in Finland*, (Ministry of Education: Helsinki), (trans by V. Mattila).

Paulsen, M., (1995a), 'Moderating educational computer conferences', in Berge, Z., & Collins, M., (eds.) *Computer mediated communication and the online classroom*, (Cresskill, NJ: Hampton Press).

Paulsen, M., (1995b), '*The Online Report on Pedagogical Techniques for Computer-Mediated Communications'*, [WWW document]. http://www.nettskolen.com/alle/forskning/19/cmcped.html

Peters, O., (2000), 'The Transformation of the University into and Institution of

effective use of educational technology, (London Routledge).

Leer, A., (1998), 'The Market for Educational Software and Multimedia', Discussion Paper for the OECD *National Expert Meeting on New Developments in Educational Software*, (Paris: mimeo), June 4-5.

Leiner, B., Cerf, V., Clark, D., Kahn, R., Kleinrock, L., Lynch, D., Postel, J., Roberts, L., Wolff, S., (1997), 'A Brief History of the Internet' *On The Internet*, [WWW document]. http://www.isoc.org/internet/history/brief.html.

Leinster-Mackay, D., (1978), 'The idea of a University: A historical perspective on some precepts and practices', *Vestes*, Vol. 20 No. 4, p.28-33.

Mäenpää, K., Luukikainen, S., (1994), *Telecommunications: Clustering, Diversity and Competitiveness*. (Helsinki: Taloustieto Oy).

Markkula, M., Suurla, R., (1998), *Passion to Learn: Benchmarking Good Lifelong Learning Practice*, IACEE Report No 9 (trans Eeva-Liisa Pitkanen) (Helsinki: Cosmoprint OY).

Martin, F., Trudeau, M., (1998), 'The Economic Impact of University Research', *Research File*, Vol. 2 No. 3, p.1-5.

Martin, F., and Trudeau, M., (1999), 'Measuring the Economic Impact of Universities: Canada' in Gray, H., (ed), *Universities and the Creation of Wealth*, (London: SRHE), p.47-65.

Mason, R., (1998), *Globalising Education: Trends and Applications*, (London: Routledge).

Mason, R., (1999), 'The Impact of Telecommunications', in Harry, K., (ed), *Higher Education Through Open and Distance Learning*, (London: Routledge) p.32-47.

Massachusetts Technology Collaborative, (1999), *Technology and Economic Growth: The Structure and Performance of Technology-Intensive Industries*, [http://www.mtpc.org/docs/rprtteg1.htm].

McCollum, K., (1997), 'A professor divides his class in two to test value of on-line instruction', *The Chronicle of Higher Education*, Vol. 43 No.24.

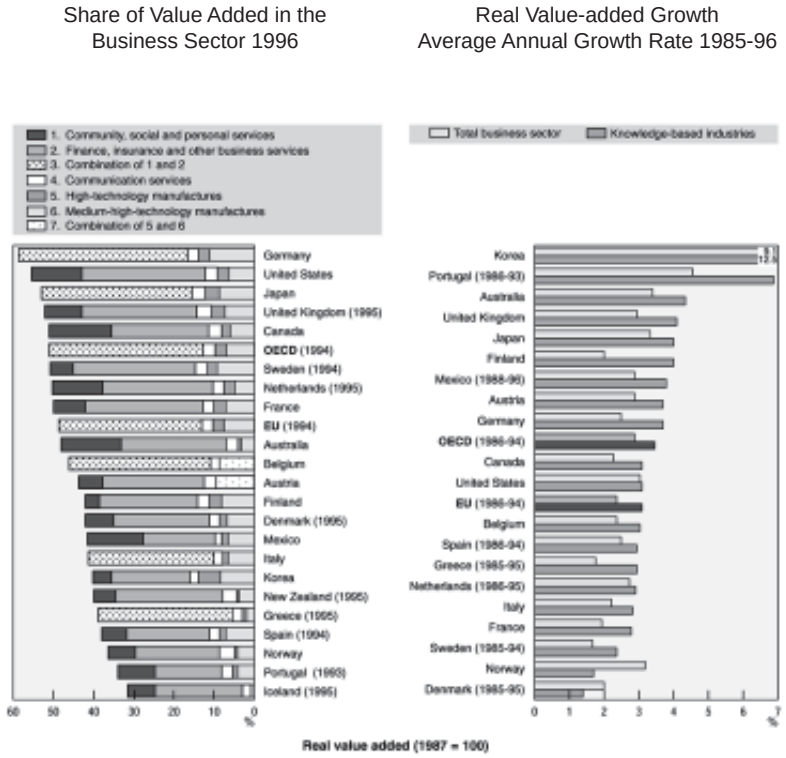
McCormack, C., Jones, D., (1998), *Building a Web Based Education System*, (New York: Wiley).

McIsaac, M., (1999), 'Distance Learning: The US Version', *Performance Improvement Quarterly*, Vol. 12, No. 2, p.21-35.

Meister, J., (1998), *Corporate Universities: Lessons in Building a World Class Workforce*, (NY: McGraw Hill).

National Committee of Inquiry into Higher Education, (1997a), 'Higher Education

Diagram 1: Knowledge Based Industries and Services



Source: OECD, *Science, Technology and Industry Scoreboard, 1999,* (OECD: Paris) p.19

In addition to the economic and financial and economic aspects of the growth in high tech industries, during the 1990's the growing information society has had a profound impact on the social and economic fabric of Finland, for example a study by Raivola and Vuorensyrja indicated a transformation was underway to:

- an inter-linked knowledge based economy and information society;
- an economy centred on information and knowledge management, through intelligent logistics and project organisation;
- an economy which both serves and is served by, a quality conscious and digitally oriented workforce.[91]

This transformation has manifested itself in various ways. As can be seen from the tables and diagrams below, Finland now has the highest number of Internet

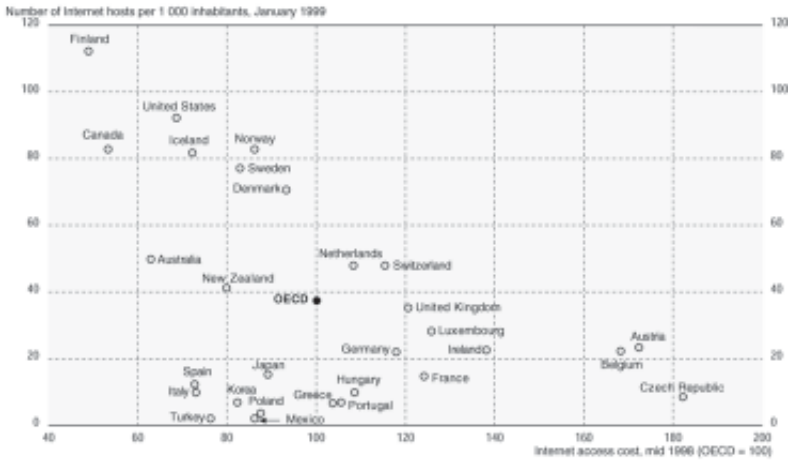
hosts per 1000, with the lowest cost of Internet access and the fastest growth in family ownership of personal computers – in 1990 only 8% of Finnish households owned a personal computer, by 1999 the figure was 42%.

Table 2: % of Households in Finland owning C&IT Equipment, March 1999

	%
Television	94
Wired Telephone	79
Mobile Phone	76
Microcomputer	42
Cable TV or satellite	37
CD-Rom Drive	31
Printer	30
Modem	23
Internet Connection	22

Source: Statistics Finland (1999)

Diagram 2: Internet Access Cost and Internet Host Density OECD Nations 1998-99



Source: OECD, *Science, Technology and Industry Scoreboard, 1999*, (OECD: Paris) p.19

Halsey, A.H., (1992), *Decline of Donnish Dominion: The British Academic Profession in the 20th Century*, (Oxford: Clarendon Press).

Harasim, L., (1993), 'Collaborating in cyberspace: Using computer conferences as a group learning environment', *Interactive Learning Environments*, Vol. 3, p.119-130.

Hardy, V, (1992), 'Introducing Computer-Mediated Communications into Participative Management Education: the Impact of the Tutor's Role', *Education and Training Technology International*, Vol. 29, No2, p.325-331.

Hawkridge, D, (1995), 'The Big Bang Theory in Distance Education' in Lockwood, F. (ed), *Open and Distance Learning Today*, (London: Routledge), p.3-12.

Heinonen, O., (1997), 'What are National Authorities Expecting from Higher Education Institutions?', *Higher Education Management*, Vol. 9 No. 2, p.7-17.

Henderson, R., Jaffe, A., Trajtenberg, M., (1998), 'Universities as a Source of Commercial Technology: A Detailed Analysis of University Patenting, 1965-1988', *Review of Economics and Statistics*, Vol.80, No.1, p.119-127.

High Level Group on the Information Society, (1994), *Europe and the Global Information Society* (The Bangemann Report) (Brussels: European Commission).

Humboldt, W., (1970), 'On the spirit and the organisational framework of intellectual institutions in Berlin', *Minerva*, Vol. 8, p.242-267 (original work published 1809).

Karran, T., and Pohjonen, J., (1999), 'Towards the Virtual C@mpus: Possibilities, Problems, and Practicalities', EADTU Conference, Milton Keynes, mimeo.

Kaukkonen, E., and Nieminen, M., (1999), 'Modeling the Triple Helix from a Small Country Perspective,' *Journal of Technology Transfer*, Vol 24, No.2&3, p.111-254.

Kaukonen, E., (1997), *The Evaluation of Scientific Research: Selected Experiences*, (Paris: OECD).

Keegan, D., and Rumble, G., (1982), 'The DTUs: an appraisal', in Rumble, G., and Harry, K., (Eds), *The Distance Teaching Universities*, (London: Croom Helm).

Kerr, E., (1986), 'Electronic Leadership: A Guide to Moderating Online Conferences', *IEEE Transactions on Professional Communications*, Vol. 29 No.1. p.12-18.

Langlois, C., (1997), 'Information Technologies and University Teaching, Learning and Research' in Hlavicka, J., & Kveton, K., (eds.), *Proceedings* of Rufis '97 Conference: The Role of the University in the Future Information Society, p.183-187.

Laurillard, D., (1993), *Rethinking University Teaching: A Framework for the*

Finnish Ministry of Education, (1998), White Paper *Higher Education Policy in Finland* (Helsinki: Finnish Ministry of Education).

Finnish Ministry of Education, (1999a), White Paper *Education, Training and Research in the Information Society: A National Strategy for 2000-2004* (Helsinki: Finnish Ministry of Education).

Finnish Ministry of Education, (1999b), *Education in Finland,* (Helsinki Ministry of Education).

Finnish Ministry of Finance (1998), *Benchmarking Finland: An Evaluation of Finland's Competitive Strengths and Weaknesses*, (Helsinki: Ministry of Finance).

Finnish Ministry of Finance (1999), *Economic Bulletin* 25th November 1999, (Helsinki: Ministry of Finance).

Finnish Ministry Of Labour (1999), *Finland's National Action Plan for Employment 1999* [http://www.mol.fi/tpts/nape_part0.html].

Finnish Ministry of Trade and Industry, (1999), *White Paper on Industrial Policy (*Helsinki: Ministry of Trade and Industry) mimeo.

Florida, R.,(1995), 'Towards the Learning Region', *Futures*, Vol. 27, No5, p.527-536.

Gladieux, L., and Swail, W., (1999), *The Virtual University and Educational Opportunity*, (Washington: The College Board).

Goddard, J., (1997), *Universities and Regional Development: An Overview*, OECD Project in the Response of Higher Education to regional needs, (Paris: OECD)

Goddard, J., Charles, D., Pike, A., Potts, G., Bradley, D., (1994), *Universities and Communities*, (London: CVCP).

Grandgenett, N, Grandgenett, D, Topp, N, Fluckinger, J, Ostler, E, Mortensen, R., (1997), 'Integrating Technology into Teaching and Learning: Three Keys to the Kingdom' *Innovations in Education and Training International*, Vol. 34, No. 4, p.252-256.

Gubernick, L., and Ebeling, A., (1997), 'I got my degree via email' *Forbes On-Line*, [WWW document]. http://www.forbes.com/forbes/97/0616/5912084a.htm

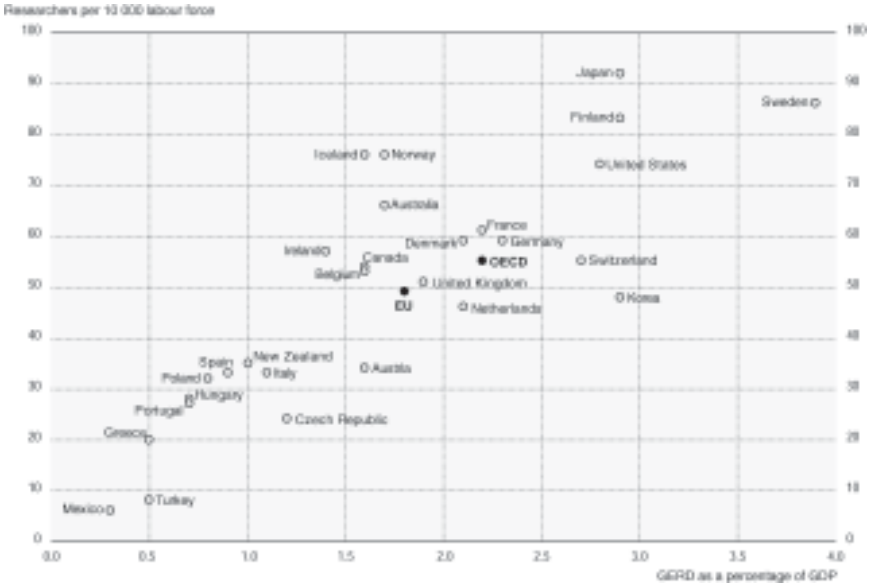
Haapakorpi, A., (1995), 'The Recession in Finland and the Labour Market for Academic Degree Holders', *European Journal of Education*, Vol.30, No.1, p.105-110.

Hall, J., (1996), 'Electronic Technology and the Modern University' in Evans, T., and Nation, D., (eds), *The Opening Education: Policies and Practices from Open and Distance Education*, (London: Routledge) p.7-20.

The need to address the challenges of such transformations lead to the Finnish government to develop an information society strategy with two inter-related aims. First, to develop and capitalise on opportunities arising from areas of national strength within the information society. Second, to identify and address the challenges and threats that the Information Society may impose.[92] This strategy integrates all aspects of national policy – for example the *White Paper on Industrial Policy* states that "Industrial policy measures are of particular importance in the development of knowledge-based services. These measures should focus on improving the efficiency and competitiveness of these services. Of the key industrial policy areas, particularly education, technology policies and financial aid should be more closely tailored to the service sector's special requirements. Knowledge-based services are mainly directed to enterprises and their export markets cover the whole world. They contribute to the efficiency and productivity of the economy by promoting specialised production and administrative processes and by enhancing industrial productivity. The employment effects of developing knowledge-based services appear in the medium or long term in the form of new permanent and well-paid jobs."[93] Similarly Finland's *National Action Plan for Employment* states that: "We need a technology policy that can help Finland retain its position in the vanguard of technological development. Research and development operations must be stimulated even in the less developed regions of the country. We need to improve the general level of expertise. Finland is being transformed into an information society where information and expertise are the key production factors. We need an education and training policy based on the needs of the labour market and the principle of lifelong learning. Equal educational and training opportunities according to the principle of lifelong learning are the right of every citizen regardless of place of residence, age, sex, language and economic position."[94]

A major element of this strategy is a high level of Research and Development spending, which stems from the "widespread consensus among Finland's political parties, and within the private sector, that the economic future and social well-being of the country can only rest on a strong foundation of education, high-quality research and know-how."[95] OECD data, shown in diagram 3, reveals that R&D expenditure as a proportion of GDP fell in the 1990s for most EU nations, but Finland is a notable exception to this trend, and is now among the top four OECD nations in respect of funding allocated to R&D and the number of researchers in the workforce.

Diagram 3: GDE on R&D as a % of GDP and researchers per 10,000 of the labour force 1997



Source: OECD, *Science, Technology and Industry Scoreboard, 1999* (OECD: Paris) p.29

Commenting on these trends, Pulkkinen notes "Finland now ranks fourth among EU countries in terms of the ratio of research spending to GDP. By increasing public R&D expenditure to 2.9 per cent Finland ensures that by the end of the century it will be among the leading countries in terms of GDP share of R&D expenditure. … The future of the economy, employment, and intellectual and material well-being depends heavily on a strong yet flexible system of innovation."[96] Within this overall trend for increased government funding for university research, there has also been a narrowing of focus so as "to guarantee the pre-requisites for basic research and lay the foundations for a strong, internationally top-level research environment. The universities are expected to concentrate their research activities on their special fields of interest."[97] To this end, Centres of Excellence have been set up as "a strategic means for promoting the internationalisation of the Finnish science system … (and) ... as a means of strengthening political and public confidence in science."[98] This trend is not unique to Finland - work by the OECD revealed that "the current trend towards concentrating research in fewer institutions, coupled with the increasingly

Chronicle of Higher Education, (2000), 'Enrollment Growth Remains Slow at Western Governors University', 14th January.

Clark, R., (1984), 'Research on Student Thought Processes During Computer-based Instruction', *Journal of Instructional Development*, Vol.7, No.3, p.2-5.

Collis, B., (1999), 'Telematics-Supported Education for Traditional Universities in Europe', *Performance Improvement Quarterly*, Vol.12 No.2, p.36-65.

Crystal, D., (1999),'The Death of Language', *Prospect*, November, p.56-59.

Dahllöf, U., Goddard, J., Huttunen, J., O'Brian, C., Román, O., Virtanen, I., (1998), *Towards the Responsive University: The Regional Role of Eastern Finland Universities*, (Helsinki: Edita).

Daniel, Sir J., (1997), Speech delivered at the American Association of Higher Education, National Conference on Higher Education, 'Learning, Technology, and the Way We Work.' Washington DC March 16-19.

Daniel, Sir J, (1998), *AAHE Bulletin*, Vol.50, No.9, p.11.

Daniel, Sir J, (1999), Speech delivered in TARA, Nova Scotia, Canada 12th April.

de Gaudemar, J., (1997), 'The Higher Education Institution as a Regional Factor', *Higher Education Management*, Vol.9 No.2, p.53-64.

Dias, M., (1994), 'New Trends in Interuniversity Co-operation at Global Level', *Higher Education Managemen*t, Vol. 6 No 1, p.104-114.

Dolence, M., Norris, D., (1995), *Transforming Higher Education: A Vision for Learning in the 21st Century*, (Ann Arbor: Society for College and University Planning).

Drew, R., Dew, P., Morris, D., Leigh, C., & Curson, J., (1996), 'The Virtual Science Park', *British Telecommunications Engineering*, Vol.1, No 4, p.322-329.

European Commission (1995), *Teaching and Learning: Towards the Learning Society*, White Paper on Education and Training, (Brussels: E.U).

European Commission, (1999), http://www.echo.lu/ist/ka3/intro.html [WWW document].

European Ministers of Education (1999), *The European Higher Education Area*, (Bologna: mimeo).

Evans, T., and Nation, D., (1996), 'Opening Education: Global lines, local connections' in Evans, T., and Nation, D., (eds), *The Opening Education: Policies and Practices from Open and Distance Education*, (London: Routledge) p.1-6.

Farrell, G., (1999), *The Development of Virtual Education: A Global Perspective* (Vancouver: The Commonwealth of Learning).

Bibliography

Abeles, T., (1998), 'The Academy in a Wired World', *Futures*, Vol.30, No.7, p.603-613.

Ahola, E., (1995), 'Review of empirical knowledge and an assessment of statistical data on the economic importance of new, technology-based firms (NTBFs) in Finland. Task 5: NTBFs public policy in Finland'. A draft report prepared for the European Innovation Management System (EIMS), November 15, 1995.

Association of Graduate Recruiters, (1995), *Skills for Graduates in the 21st Century*, (Cambridge: A.G.R.).

Balazs, K., (1996), 'Academic Entrepreneurs and their Role in Knowledge Transfer', *STEEP Discussion Paper No 37*, (Brighton, University of Sussex) mimeo.

Bjarnason, S., Davies, J., Farrington, D., Filden, J., Garrett, R., Lund, H., Middlehurst, R., Schofield, A., (2000), *The Business of Borderless Education: UK perspectives: Summary Report*, (London: CVCP)

Bates, A., (1995), *Technology, Open Learning and Distance Education*, (London: Routledge).

Berg, G., (1998), 'Public Policy on Distance Learning in Higher Education: California State and Western Governors Association Initiatives', *Education Policy Analysis Archives*, Vol. 6. No. 11.

Bligh, D., (1995), 'International Education: Australia's Potential Demand and Supply', (mimeo) paper presented to the 1995 *International Education Conference*, Brisbane, October 1995.

Botkin, J., Elmandjra, M., Malitza, M.,(1979), *No Limits to Learning: Bridging the Human Gap*, (Oxford: Pergamon).

Brittain, M., Chamber, M., Marriott, P., (1997), 'Design Considerations in the development and delivery of digital learning media', (mimeo) paper presented at the *ED-Media Conference*, Frieburg , Germany.

Buchbinder, H., (1993), 'The market oriented university and the changing role of knowledge', *Higher Education*, Vol.26, p.331-347.

Bush, Vannevar, (1945), *Science The Endless Frontier,* A Report to the President by Vannevar Bush, Director of the Office of Scientific Research and Development, July 1945 (United States Government Printing Office: Washington).

Chambers, M., (1999), 'The efficacy and ethics of using digital multimedia for educational purposes', in Tait, A., and Mills, R., (eds) *The Convergence of Distance and Conventional Education*, (London: Routledge) p.5-16.

important teaching and training roles of higher education systems as a whole, is creating noticeable institutional tensions."[99] This concentration of research within a smaller number of centres of excellence helps to achieve critical mass but, to ensure that the impact of research is maximised throughout the economy, will also require strong dissemination processes.

However, in his study of the innovation system in Finland, Numminen found that "R&D cooperation with universities is largely concentrated among large firms" and that "the fact that funding by Finnish firms accounts for only some 5% of all research activities within the higher education system, seems to point to the conclusion that the level of industry-university cooperation is very low indeed" leading him to conclude that "although there has been a marked increase in the various forms of university-industry innovation in recent years, the effectiveness of the use of the university knowledge base by the industry continues to be a major concern."[100]

The Impact of Science Parks and Technology Transfer.

A crucial aspect of the innovation process and technology transfer between universities and business in Finland has been the very successful role of Science Parks and Technology Transfer Companies. As table 3 shows there are now circa 800 firms located in Science Parks, and Pulkkinen reports that the annual growth rate in the number of employees in Science Parks has been 20-30% during the last five years.[101] Science parks have increased both in number, and in the fields of technology they encompass, such that most major Finnish industries are now represented by firms on science parks, often working in collaboration with a local university. As table 4 shows, universities have established more formal ways of commercialising their research through technology transfer companies. Typically such companies offer four types of services: licensing of research results; services for the commercialising of research results and products developed in universities; management assistance for new business start-ups and research projects; co-ordination of monitoring activities for new product ideas.[102]

Table 3: Science Parks in Finland in 1995

Science park	Firms	Employees	Adjoining city population
Oulu (Teknopolis, Medipolis)	250	1500	100 000
Espoo	200	1 500	200 000
Turku (DataCity, ElectroCity, BioCity)	100	2 000	160 000
Tampere (Hermia)	150	1 500	180 000
Lappeenranta (Kareltek)	50	500	55 000
Kuopio (Teknia)	50	500	85 000
Jyväskylä	50	1 000	72 000
Joensuu	20	100	50 000
(Helsinki)	-	-	500 000

Source: Ahola, E., (1995) *Review of empirical knowledge and an assessment of statistical data on the economic importance of new, technology-based firms (NTBFs) in Finland*

Table 4: Technology transfer companies in 1995

Firm (city and the year of establishment)	Owners
Aboatech Oy (Turku, 1993)	SITRA, and the foundations of the University ofTurku and ÅboAkademi
HU Licencing Oy (Helsinki, 1993).	Helsinki University Holding Oy and SITRA
Finntech Oy (Espoo, Otaniemi, (1984 Otatech), 1993)	VTT, Helsinki University of Technology, SITRA
Oulutech Oy (Oulu, 1994)	SITRA, the foundation of the University of Oulu and the Science Park of Oulu
Tamlink Oy (Tampere, 1986)	SITRA, Tampere University of Technology, Foundation of the University of Technology, City of Tampere and KERA

Source: Ahola, E., (1995) *Review of empirical knowledge and an assessment of statistical data on the economic importance of new, technology-based firms (NTBFs) in Finland*

STAGE 4 National Policy Evaluation	European and National Government Agencies (Ministries)	Regional/Local Government Agencies	National and Regional Business Consortia	National and Regional ICT Providers (Television, radio, phones, publishers)	University, Open University and Polytechnic Sectors	Academic Staff Associations and Trade Unions	Professional Associations	General Public
Evaluate impact of NVU on Information Society and Knowledge Economy Policy Strategies	Provide macro level data on costs and benefits and impact of NVU on Information Society Objectives (educational access policies, equality of opportunity, national skills levels and technological transfer and development) within national and European framework	Provide micro level data on costs and benefits and impact of NVU on Regional/ Local Objectives (educational access policies, equality of opportunity, national skills levels and technological transfer and development) within national and regional/local framework Provide micro level	data on costs and benefits and impact of NVU on National/ Regional Business Objectives (improved productivity, higher skills levels greater use of technological transfer and development) within national and regional/local framework Provide micro level	data on costs and benefits and impact of NVU on National/ Regional Use of ICT (improved ICT awareness and skills, greater usage of ICT in the workplace and at home, greater transfer of ICT skills in to other areas of life) within national and regional/local framework Provide institutional	and sectoral data on costs and benefits and impact of NVU on teaching and research functions (increased student numbers, improved ICT awareness and skills, greater usage of ICT in teaching, increased research activities and collaboration) within national and regional/local framework	Provide sectoral data on costs and benefits and impact of NVU on teaching and research functions (increased workloads, needs for staff development to provide new skills sets, altered academic roles, alterations in job satisfaction, changes in recruitment to the profession) within national and regional/local framework	Provide data on costs and benefits and impact of NVU within specific professions (changes in numbers entering professions, alterations in professional accreditation, changes to the nature of professional roles and responsibilities) within national and regional/local framework	Data gathered via opinion polls and government household and social surveys
Exercise strategic foresight and redefine European and National Information Society Objectives and Policy Options	Discussion at National Government level of impact of NVU on previous and new national and global policy objectives and options	Regional discussions input to national level and European Level via the Council of the Regions	National/ Regional discussions, input to national debate via business organisations and links with national government and parties	National/ Regional discussions, input to national debate via business organisations and links with national government and parties	Institutional, regional and sector wide debate, academic analysis of impact of NVU and new policy options at regional and national level	Sector wide debate, analysis of impact of NVU and new policy options and contributions to policy making at regional and national level	Regional/National debates and discussions via professional conferences, journal articles, etc of impact of NVU and new policy options	Bring results into the national arena via ministerial press releases, newspaper coverage of government policy.

STAGE 3f Regional/Local Design and Development Projects	National funding Council for higher education	Regional/Local Government Agencies	National and Regional Business Consortia	Academic administration (departmental, institutional or national)	Resource administration (departmental, institutional or national)	Courseware development team (Inter- or intra-institutional)	Discipline area (Departmental, institutional, or national)	Individual academic lecturer
Commencement of virtual science park and technology transfer functions	Promote involvement of universities and companies at national level	Promote involvement of universities and companies at local level	Promote involvement of companies at local level	Promote involvement of university departments	Manage marketing, distribution of course materials		Promote involvement of university departmental staff	
Integration with existing research activities	Establish local and national fora for research collaboration and collate results	Establish local fora for research collaboration	Review of existing research activities to see how they might be modified	Coordinate institutional input in to discussion on research collaboration			Set up a forum for research collaboration	Review of existing research activities to see how they might be modified
Academics and other users briefing	Provide national guidelines for academics and businesses on research and technology transfer	Disseminate national and local guidelines to academics and businesses on research and technology transfer	Disseminate national and local guidelines to businesses on research and technology transfer	Disseminate national and local guidelines to academic departments on research and technology transfer			Disseminate national and local guidelines to academic staff on research and technology transfer	Review progress on current collaborative research
Evaluation of effectiveness of virtual science park and technology transfer functions	Establish and Implement local and national evaluation procedures.	Implement local and national evaluation procedures.	Provide materials to aid evaluation Monitor companies use of virtual science park and level of research collaboration	Provide materials to aid evaluation of academic use of virtual science park and level of research collaboration			Collate data on academics use of virtual science park and level of research collaboration	Provide data on individual use of virtual science park and level of research collaboration
Document impact on technology transfer	Collate results and disseminate results via national and local fora	Receive and distribute results to local communities	Receive and distribute results to companies	Receive and distribute results to academic departments			Receive and act on published reports	Report on lessons learned

Summary

Although this over-view is necessarily partial, nevertheless it identifies particular trends and facets within Finnish society, which a development like a virtual university should help to address. The information society is arriving in Finland (both in the home and at work) at an acceleratory rate, which is considerably faster than that elsewhere in the OECD. The effects of policies which further increase the use and impact of communications and information technology, yet also attempt to improve equality of opportunity, will be felt across all aspects of business and personal life.

A national virtual university will provide a useful and flexible policy instrument to:

- *Ensure adequate IT training for all people, in a working environment in which ITC competence is viewed as an essential entry skill;*
- *Reduce inequalities in access to higher education caused by differences in age, sex, ethnic background, social class and geographical location;*
- *Allow training to take place at home and at work, as required by the learner, and through a variety of different and complementary media;*
- *Enable the widespread dissemination of research results from a small number of research centres of excellence;*
- *Promote technology transfer from universities to industry to bring fresh and original ideas on-stream in the form of new products, processes and services to market quickly;*
- *Enhance, extend and develop the current links which exist between universities and businesses through Science and Business Parks.*

The Higher Education Network

The most critical factor for any government seeking to use new technologies to promote access to higher education by means of virtual campuses and similar developments is the existing configuration of universities, open universities and distance education provision. Moreover, "institutions of higher education mirror the culture and the socio-economic structure of their private or public (national/governmental) sponsors in the way they are organised and in the content of their curriculum."[103] The current h.e. structure constitutes the foundation on which virtual campus developments will be built, as completely re-configuring higher education to take account of telematic innovation in curriculum delivery would be politically impossible and financially costly. The extent to which open universities will lead the drive towards virtual education delivery is also contingent upon the preferred strategy of central government, which may wish limit such developments to specific institutions, or allow all higher education institutions to develop their own individual virtual university projects, or encourage collaboration to build a national system.[104] Determining which matrix of distance provision

and national policy is more likely to possesses the strategic foresight to deliver the Information Society most successfully is clearly problematic but of obvious importance, given that the speed of development of new technologies means that an opportunity, once lost, is increasingly difficult to retrieve.

Hence the tactics adopted by individual universities to utilise new technologies in learning, must bolster rather than contradict strategies implemented by governments at national level. Furthermore, the policy adopted at local and regional level will be crucial in determining both how successfully individual countries respond to the economic and social pressures of the developing global knowledge economy, and whether they manage to advance national prosperity by using new technologies. Consequently, national strategies will define the policy arenas within which universities will operate, as they contemplate how to realise aspirations for a virtual campus. In Finland a specific strategy group has been designated within the Ministry of Education to consider the building of a National Virtual University, while in most other European nations no such similar strategy group has been established at state level. Furthermore in Finland it is intended that "A multidisciplinary virtual university will be established to produce and transmit high-quality educational services and enable network-oriented research. The network will include services offered by the virtual open university"[105] and "a national network service will be implemented to support teaching and learning through developing the existing services" which will "provide all users of educational services access to the public educational services in the network through a single interface."[106]

Universities

University education in Finland has a distinguished lineage, which started with the establishment of Turku Academy in 1640, but then growth was slow - by 1960 there were 10 universities. However, the 1960's saw the number double and currently there are ten multi-disciplinary institutions, six specialist institutions and four art academies. By 1998 the 20 universities had a total of 147,300 f.t. university students, making up 29.4% of all school leavers, and employing 11,500 teaching and research staff, with over 14,000 other staff. The 1997 Universities Act defines the purpose of Universities in Finland as to:

> "promote independent research and scientific and artistic education, to provide instruction of the highest level based in research, and to raise the young to serve the fatherland and humankind. Universities shall arrange their operations in order for research, education and instruction achieve high international standards, by observing ethical principles and good scientific practice" [107]

STAGE 3e Regional/Local Design and Development Projects	National funding Council for higher education	Regional/Local Government Agencies	National and Regional Business Consortia	Academic administration (departmental, institutional or national)	Resource administration (departmental, institutional or national)	Courseware development team (Inter- or intra-institutional)	Discipline area (Departmental, institutional, or national)	Individual academic lecturer
Introduce National IT Course Delivery and CMC Platform	Assess effectiveness of IT course delivery and CMC platform against national and local plans and needs. Institute service level agreements and problem reporting structures	Assess effectiveness of IT course delivery and CMC platform against national and local plans and needs. Report problems and staff development needs	Assess effectiveness of IT course delivery and CMC platform against national and local plans and needs. Report problems and staff development needs	Assess effectiveness of IT course delivery and CMC platform against national and local plans and needs. Report problems and staff development needs	Assess effectiveness of IT course delivery and CMC platform against national and local plans and needs. Report problems and staff development needs	Assess effectiveness of IT course delivery and CMC platform, and report problems and staff development needs	Assess effectiveness of IT course delivery and CMC platform, at subject level and report problems and staff development needs	Assess effectiveness of IT delivery platform in courseware delivery, at individual level and report problems and staff development needs
Dissemination of course ware	Promote involvement of publishers at national level	Promote involvement of publishers at local level	Promote involvement of publishers at local level	Promote involvement of publishers at local level	Manage marketing, distribution of course materials			
Students and other users briefing	Provide national guidelines for teachers and students advice on the use of courseware	Disseminate national and local guidelines for teachers and students advice on the use of courseware	Disseminate national and local guidelines for trainers and students advice on the use of courseware			Provide teachers and students guide to the use of courseware	Provide teachers and students guide to the use of courseware. Review material and provide links to rest of course	Review material and provide links to rest of course
Student support and debriefing	Collate local and national data on need for additional support			Collate institutional data on need for additional support		Use teacher's guide to suggest additional support	Plan provision of additional support	Plan provision of additional support
Integration with existing course	Establish local and national fora for cross course collaboration and collate results			Coordinate institutional input in to discussion on cross course collaboration		Set up a forum for cross course collaboration	Set up a forum for cross subject collaboration	Review of the teaching to see how it might be modified
Evaluation of pedagogical effectiveness of teaching materials and support mechanisms	Implement local and national evaluation procedures.		Provide materials to aid evaluation Monitor students use of courseware in corporate settings	Provide materials to aid evaluation of academic support mechanisms	Provide materials to aid evaluation of resource management support mechanisms	Provide materials to aid evaluation Monitor students use of courseware and support mechanisms	Monitor students use of courseware Analyse assignments Change format of briefings, de-briefing, support as necessary	Monitor students use of courseware Analyse assignments Change format of briefings, de-briefing, support as necessary
Document pedagogical lessons learnt	Collate results and disseminate results via national and local fora	Receive and distribute results to local communities	Receive and distribute results to companies	Receive and distribute results to academic departments	Receive and distribute results to service departments	Receive and act on the reports	Receive and published reports	Report on lessons learned

STAGE 3d Regional/Local Design and Development Projects	National funding Council for higher education	Regional/Local Government Agencies	National and Regional Business Consortia	Academic administration (departmental, institutional or national)	Resource administration (departmental, institutional or national)	Courseware development team (Inter- or intra-institutional)	Discipline area (Departmental, institutional, or national)	Individual academic lecturer
Staff development for research and technology transfer functions	Review policy on local economic development and technology transfer. Provide funding for staff development. Ensure sharing of best local practice at national level	Set up staff development programme Promote use of materials developed elsewhere	Set up staff development programme Promote use of materials developed elsewhere	Set up staff development programme Promote use of materials developed elsewhere	Identify staff development needs for additional research and technology transfer activities		Identify individual staff development needs for additional research and technology transfer activities	
Staff development for administration and support functions	Provide funding for staff development. Ensure sharing of best local practice at national level	Set up staff development programme	Set up staff development programme	Set up staff development programme for on-line academic management functions	Set up staff development programme for on-line resource management functions		Identify individual staff development needs for additional research and technology transfer activities	
Staff Scheduling				Manage administration of teaching, research and staff development	Assess software needs for trac		Set up a forum for teachers to discuss ideas and experience	Input to forum for teachers to discuss ideas and experience
Student assessment standards	Review national policy on academic standards and student assessment modes and standards		Ensure compliance between corporate and academic assessment modes and standards and with national benchmarks	Collate institutional standards to ensure institutional and national compliance	Assess software needs for marking and tracking student assessments		Decide on changes to assessment requirements Communicate new requirements to students and academic staff	Incorporate assessment changes
Evaluation of Implementation	Review progress against national and local plans and targets	Review progress against national and local plans and targets	Review progress against national and local plans and targets	Review progress against national and local plans and targets	Review progress against local plans and institutional targets		Provide staff time to monitor implementation	
Document the logistical lessons learned	Revise national implementation plans and local plans and targets	Use reports to revise implementation plans and policy on the use of new technologies in teaching and research	Use reports to revise implementation plans and policy on the use of new technologies in teaching and research	Assign committee to received and act on the evaluation reports	Monitor logistics of implementation	Disseminate the lessons learnt and agree changes to targets and activities	Disseminate the lessons learnt and agree changes to targets and activities	

The university system has been reconfigured in the last decade by:

- Replacing the multi-disciplinary masters degree programmes with subject based syllabi usually operating through a major and minor degree matrix and leading to a bachelor's degree;
- Ensuring comparability with other international higher education curricula;
- Improving credit transfer between institutions to enable student choice and mobility;
- Focusing higher education more directly on labour market requirements by resourcing courses in hi-tech subjects (I.T., electrical engineering, electronics, telecommunications, etc.);
- Increasing evaluation of university activities with performance based funding, against targets and objectives agreed by individual universities with the Ministry of Education.

These reforms have made Finnish higher education more flexible and responsive to the needs of students and industry. From an international perspective there are various aspects of the system which are worthy of note:

Subject Choice - Most Finnish universities offer joint subject degree courses based on a major/minor configuration, with the minor subject sometimes available from another subject field or even faculty. However, these degree schemes would not be considered as "modular" in the British or American sense, and hence lack the high level of flexibility and student choice associated with such programs.[108] Additionally there is little sign of enabling learners to design their own curricula, through (for example) Learning Contracts.

Accreditation - There appears to be little attempt to facilitate entry through the use of APL (Accreditation of Prior Certificated Learning) or AP(E)L, (Accreditation of Prior Experiential Learning) as has been used in, inter alia, the U.K. to promote entry by mature students and/or disadvantaged groups.

Free Tuition - The Finnish system does not levy tuition fees on students, which is now probably exceptional among modern Western nations. Currently the maximum support available for completing a Master's degree covers 55 months and includes a study grant, housing support and a State guaranteed loan. Clearly, this is an integral part of the national policy of equality of opportunity of access to higher education, irrespective of income or geographical location. It may be difficult to continue with this policy unless more cost effective ways are utilised for learning (e.g. via the use of new technologies and the virtual university), or cross-subsidisation of home students is made possible by selling higher education to external markets by use of the WWW.

Long Completion Times - The average age for completion of Master's degrees in Finland is 27, and the median age at which students complete their doctorates

is 37.[109] This is longer than in most European countries and has been examined by, inter alia, the OECD. These delayed graduations have various impacts including:

- Increased burdens on universities, in terms of teaching, (classes may be larger), and administration (ensuring accurate tracking of, and maintaining data on students for long periods), as well as the opportunity cost (less time for research) and the problem of long term resource planning when the speed of degree completion by students cannot be forecast;
- Increased burdens on public expenditure through longer periods of government support for students;
- Reduced productive working lives for students, as delayed entry into employment reduces the productive career of graduates, especially at Ph.D. level;
- Redundant qualifications, as much of the knowledge a graduate possesses may be out of date, when completion takes so long;
- Increased labour shortages as delayed entry into employment may create shortages of skilled labour, which both restrict economic growth and can produce wage inflation.

Collaboration with Training Providers and Industry - Finnish universities collaborate with industries in research, but seem less innovative in collaboration through (for example) accrediting and franchising courses run by other training providers, or the development of Work Based Learning Degrees, in which professional activities undertaken at work are assessed to see whether, and to what extent, they deliver the same learning outcomes as university courses.

Life Long "Learning to Learn" Skills - The Dearing Committee of Inquiry into Higher Education in the UK Report in 1997 emphasised the need for four key skills, which all graduates need whatever they intend to do in later life, namely:

- communication skills;
- numeracy;
- the use of information technology;
- learning how to learn.[110]

This point is alluded to in Sinko and Lehtinen's study in which they state "the application of ICT can enrich traditional university education and narrow the gulf between traditional academic studies and the changing demands of working life. With innovative use of technology, universities can train their students in the key skills called for in modern working life, such as teamwork, networking, internationalization, project management, communication, solving complex problems without compromising on their basic task of academic education."[111] Additionally Haapokorpi has described the way in which the recession in Finland in the early '90s sharpened competition in the labour market and forced universities

STAGE 3c Regional/Local Design and Development Projects	National funding Council for higher education	Regional/Local Government Agencies	National and Regional Business Consortia	Academic administration (departmental, institutional or national)	Resource administration (departmental, institutional or national)	Courseware development team (Inter- or intra-institutional)	Discipline area (Departmental, institutional, or national)	Individual academic lecturer
Test Administrative Support Mechanisms	Ensure local system meets national requirements	Ensure local system meets requirements e.g. career and employment advice services and public service support features and cmc needs	Ensure local system meets requirements e.g. for vocational guidance, continuous professional upadating, and research and tecnology transfer and cmc needs	Ensure local system meets requirements e.g. for student support, electronic library facilities, on-line course assessment, and cmc needs	Ensure local system meets requirements e.g. for course registration, student tracking, on-line payments, and cmc needs			
Plans resourcing and scheduling	Monitor local project management against local and national plans	Monitor project management against local and national plans	Monitor project management against local and national plans	Monitor project management against local and national plans	Agree development resources	Carry out developmental testing and piloting of courseware Report on efficiency of procedure to monitoring committee	Agree staff and student time commitment	
Administration of hardware, software materials	Promote bulk purchasing of hardware and course ware Promote transfer of course ware across institutions	Provide support staff for maintenance and administration	Provide support staff for maintenance and administration	Provide support staff for maintenance and				
Staff development for teaching and learning	Review policy on appraisal and quality assurance. Provide funding for staff development. Ensure sharing of best local practice at national level	Set up staff development programme Promote use of materials developed elsewhere	Set up staff development programme Promote use of materials developed elsewhere	Set up staff development programme Promote use of materials developed elsewhere Determine changes to appraisal and promotion procedures		Identify staff development needs for use of all new courseware	Identify departmental staff development needs for use of subject based courseware	Identify individual staff development needs for use of subject based courseware

STAGE 3b Regional/Local Design and Development Projects	National funding Council for higher education	Regional/Local Government Agencies	National and Regional Business Consortia	Academic administration (departmental, institutional or national)	Resource administration (departmental, institutional or national)	Courseware development team (Inter- or intra-institutional)	Discipline area (Departmental, institutional, or national)	Individual academic lecturer
Address students' needs at undergraduate and post graduate level	Utilise higher education statistics on course demand		Audit need for work based learning	Collate and analyse student feedback on course quality and delivery	Provide analysis of student recruitment and drop out rates	Provide analysis of exam scripts, teacher's experience elicit student's perceived problems	Provide assessment of demand for existing subjects and inter-disciplinary courses	
Determine key areas of the curriculum and research project functions for the Region	Promote consortia to design transferable courseware Establish links with schools and training organisations	Facilitate project management, monitoring and evaluation	Identify joint areas for industry/h.e. collaboration in both teaching and research	Identify institutional staff teams in chosen subject/functional areas	Estimate resource implications of freeing staff and resources for local/ regional project	Analyse course material at other universities in national and international arenas	Convene forum of teachers to identify key areas for development of learning materials and shared research	Input into discussions at institutional and within subject peer group
Build on what is known and benchmark best practice	Provide for maintenance of national database Promote funding of subject research and to improve learning Provide funding for evaluation of mediation multimedia	Provide local data on successful research collaboration through science parks and technology transfer.	Provide advice on best practice for commercial/ industrial/ professional training	Provide advice on best practice for research activities, technology transfer and university teaching	Promote access to national database Provide funding for journals and travel	Access to national database of courseware, reviews Literature search in key journals Attend key conferences	Identify appropriate subject specific pedagogy for telematic delivery, and research expertise for virtual science park	Join university and national networks for virtual learning and research
Use an explicit teaching design methodology	Establish design standards Establish copyright policy	Start to consider common software platform and hardware needs	Conduct audit of existing hardware provision and software platforms	Conduct audit of existing hardware provision and software platforms	Administer refereeing process for designer of course ware	Address critical aspects of the learning process Make effective use of the media Address design standards Consider IPR issues	Set up forum for discussion of the academic standards	
Institute efficient production procedures	Promote bulk purchasing of productivity tools Promote use of national and local networks	Use productivity tools, and communication networks during development	Use productivity tools, and communication networks during development		Provide funding and support for productivity tools	Use productivity tools, and communication networks during development		
Test IT System Features	Ensure local system meets national requirements	Ensure local system meets requirements of local learning community	Ensure local system meets requirements of business community	Ensure local system meets requirements of academic delivery systems	Ensure local system meets requirements of academic management systems	Ensure local system meets requirements of academic courseware		

to address the problems of the transition from higher education to working life in which "personal competences and skills play an increasingly important role in job recruitment."[112]

Polytechnics

Since the 1970's, growth in tertiary education has been met by the universities, with the setting up of the Polytechnics adsorbing some of the increased demand for degree level education. The Polytechnic system was established in the 1990's as a non-university sector in higher education and comprises a nationwide network of regional institutions of higher education, which was built up from the previous system of post-secondary vocational education. In contrast to the universities, the major objective of studying at a Polytechnics is to:

> "provide the necessary knowledge and skills for operating in occupational expert functions on the basis of the requirements set by working life and the development thereof"[113]

The general objectives of polytechnics are to:

- raise the standard of education;
- react to changing needs for expertise and skills;
- make vocational education more attractive;
- improve the international compatibility of vocational education;
- make the vocational education system more functional;
- decentralize the administration of vocational education;
- reinforce the regional impact of vocational education.

Since 1991, 20 permanent and 10 temporary Polytechnics have been established, and when the Polytechnic sector is fully operational it will provide places for about 100,000 students. It is difficult to assess the impact of the Polytechnic sector in Finland, given that it is still not fully implemented, however their development at this time is very interesting. In contrast to Finland, other countries which had experimented with Polytechnics since the 1950's, spent the 1990's dismantling the divide between the two institutions and making all higher education providers "universities", so in the UK, Australia and more recently New Zealand, the binary split was removed. However this convergence may be unusual - a cross-European appraisal reveals that maintaining the distinction between university provision and degree level vocational training is still the norm (as between the universities and the Fachhochschulen in Germany). A study of British polytechnics[114] revealed that they had often been of crucial importance in curricula innovations, and were instrumental in bringing in new ways of teaching and learning - so for example, modular degree schemes were pioneered by the Polytechnics, and quality monitoring was handled by a central body called the CNNA. Both these ideas have now moved into mainstream higher education policy in the UK.

An analysis of higher education in Eastern Finland, indicated that "the polytechnics will provide real challenges to the universities."[115] This analysis also highlighted the facts that:

- polytechnics are owned by municipalities, who also make the final decision over their level of funding;
- the administrative boards of the polytechnics consist of local and regional politicians who are more likely to commit the institution to regional objectives;
- budget funding of universities is based of performance criteria, while the funding of polytechnics is based on enrolment figures.

This growth of polytechnics in Finland is an interesting development, and from an international perspective, various aspects of the system are worthy of note:

Changing Status - in most nations Polytechnics have started off as "poor relations" of universities, and were often considered as academically inferior. However, the inability of the university sector to provide the skills required by industry and their conservative nature has lead to polytechnic degrees being seen as more vocationally relevant (UK polytechnics, for example, pioneered Business Studies degrees).

Funding - currently the Finnish Polytechnics can use local funding, without reference to the performance indicators applied to universities. Polytechnic teaching is normally cheaper and utilises higher staff student ratios than universities. Hence if both Universities and Polytechnics provide degree schemes, the Polytechnic cost model could be used to push down higher education costs across the entire system.

Role in the H.E. Network and Virtual University - Polytechnics have usually been concerned with teaching, rather than research, with a vocational rather than academic emphasis and the mission statement for polytechnics in Finland is functional, while that of universities is inspirational. Hence, if the National Virtual University is concerned with continual professional updating, and teaching as well as research, the polytechnics should have a major role.

Open University Activities

The development of distance education and Open University provision in Finland was organic and grew out of supplementary holiday courses for primary school teachers first organised by Helsinki University at the end of the 19th Century. The subsequent development of summer universities in Finland, first in Jyvaskyla and Turku Universities, and then in the major cities that sought the establishment of permanent universities in their municipalities, provided both the building blocks for Open University provision and its particular Finnish character. This guarantee of parity of regional educational provision was an important factor in the development of Finnish OU activities.

STAGE 3a Regional/Local Design and Development Projects	National funding Council for higher education	Regional/Local Government Agencies	National and Regional Business Consortia	Academic administration (departmental, institutional or national)	Resource administration (departmental, institutional or national)	Courseware development team (Inter- or intra-institutional)	Discipline area (Departmental, institutional, or national)	Individual academic lecturer
Establish local/ regional project teams	Define national and local responsibilities, terms of reference, chairs and membership	Provide physical resources for local/ regional teams, and representatives	Identify and provide suitably qualified representatives for local/regional teams	Identify and provide suitably qualified representatives for local/regional teams	Identify and provide suitably qualified representatives for local/regional teams	Identify and provide suitably qualified representatives for local/regional teams	Identify and provide suitably qualified representatives for local/regional teams	
Draw up local implementation plan	Ensure goodness of fit with national plan. Agree and implement formative evaluation and progress reporting strategies	Ensure goodness of fit with local/regional plan	Ensure goodness of fit with corporate plans and aspirations	Ensure goodness of fit with national and institutional plans	Ensure goodness of fit with national and institutional plans			
Set up a teaching and learning development team	Tie funding to meeting of standards and project completion deadlines	Identify specific software needs for local community	Identify and second staff for course development work	Monitor composition and working of team		Identify and involve people with complementary skills and knowledge	Provide subject and teaching and learning expertise	Provide subject and teaching and learning expertise
Set up a technology transfer development team	Tie funding to meeting of standards and project completion deadlines	Identify specific software needs for local virtual science park and technology transfer work	Identify specific software needs for local virtual science park and technology transfer work		Identify specific software needs for local virtual science park and technology transfer work		Identify specific software needs for local virtual science park and technology transfer work	
Set up a computer network team	Agree compliance with national plan and project completion deadlines	Identify extent of compliance with national plan and need for local variation	Identify extent of compliance with national plan and need for local variation		Identify extent of compliance with national plan and need for local variation			
Set up a support services team	Agree compliance with national plan and project completion deadlines	Identify compliance with national plan and local needs for career and employment advice and public service support features. Identify cmc needs and facilities	Identify compliance with national plan and local needs for vocational guidance, health and safety, continuous professional upadating, and research and tecnology transfer support services. Identify cmc needs and facilities	Identify compliance with national plan and local needs for multimedia, student support, electronic library facilities, on-line course assessment, learning diagnostic tools Identify cmc needs and facilities	Identify compliance with national plan and local needs for course registration, student tracking, on-line payments, Identify cmc needs and facilities	Identify course ware support and cmc needs and facilities		

STAGE 2 National/Regional/ Local Data Gathering and Consultation	National funding Council for higher education	Regional/Local Government Agencies	National and Regional Business Consortia	Academic administration (departmental, institutional or national)	Resource administration (departmental, institutional or national)	Courseware development team (Inter- or intra-institutional)	Discipline area (Departmental, institutional, or national)	Individual academic lecturer
Assess national/ regional labour market needs	Collate data from regional agencies	Undertake skills audit, provide labour market data	Assess corporate demands for skills and competences		Provide alumni data on 'First Destination' of graduates and		Provide academic analysis on labour market trends	Input via involvement in teaching and research
Address demand for undergraduate, postgraduate and professional courses	Utilise macro level higher education statistics on course demand	Analysis of future demand from local schools	Audit future needs for graduates and the need for continual professional updating	disaggregated data on local/regional demand for courses	postgraduates, and level of local/regional graduate retention		Provide data on demand for existing subjects	
Assess needs of other potential users – socially excluded groups and University of the third age	Examine demand for courses from excluded groups	Produce demographic analysis to identify need among disadvantaged groups and third age students	Identify training required to enable minority groups to enter the world of work	Assessment of provision for minority groups (e.g. disabled)		Identify learning difficulties of disadvantaged groups	Report barriers to h.e. entry identified by applicants from minority groups	
Assess research and technology transfer needs of national and local industries and businesses	Collate data from other sectors - national economic aspirations and research and technology transfer needs	Assess needs of local businesses and industries, and provision of science parks and technology transfer	Assess current level of research and development skills, current and future involvement in science parks, and estimate future demands	Assess current level of research activities and estimate future demand for collaborative work via NVU	Assess current level of research activities and estimate cost and resourcing implications of future collaborative work via NVU		Assess current research activities and aspirations for collaborative work via NVU	Assess current research activities and aspirations for collaborative work via NVU
Determine and validate course matrix and research profile for NVU, and fit with existing university activities	Aggregate regional data to produce national scenario and identify regional specialisms	Estimate local/ regional costs implications for hardware needs		Assess impact of NVU delivery on teaching and research	Assess impact of full course delivery on existing resource	Assess current level of core course delivery	Identify areas of teaching and research excellence in subject domains and combinations	Input via Departmental involvement in teaching and research
Assess NVU start-up and running cost implications as full degree deliverer across course matrix and research partner	Estimate additional financial resources for start-up and running costs of NVU			Provide estimates of additional staff and infrastructure resources needed for start-up and running NVU	Estimate resource implications of starting and running NVU degree programs across all universities	Estimate needs for new software, hardware upgrade, and staff development	Provide estimates of additional staff and capital resources	
Translate Vision into regional tactical units	Assess inputs from other agencies and consortia	Identify regional needs and strengths	Identify national and regional needs and corporate strengths	Identify national and regional needs and corporate strengths	Identify national and regional needs and sectoral and institutional strengths	Identify national needs and sectoral and associational strengths	Identify national and professional needs and strengths	
Initiate Project Planning Teams	Appoint national planning team	Establish regional teams and identify national representatives	Identify representatives for national and regional teams	Identify representatives for national and regional teams	Identify representatives for national and regional teams	Identify representatives for national and regional teams	Identify representatives for national and regional teams	Identify representatives for national and regional teams

Like the activities of other Open University in Europe, Finnish Open University provision saw a sharp increase in student numbers which grew from some 39,000 students in 1990 to 75,000 by 1996.[116] However the philosophy of Finnish OU activities differs from those of other European OUs. Finnish Open University activities comprise "an open learning system constructed to further equality in education, which means that the open university is not a separate educational organisation but that teaching is realised through a cooperation network. … The open nature of teaching is intended to promote educational and regional equality."[117] This cooperative and regional aspect means that most Finnish universities participate in Open University work by providing teaching in cooperation with some 300 organisations, in over 200 municipalities. This community aspect, which derives from the original summer school movement, is a strength and a dominant feature of Finnish Open University activities. Hence, although there are OU activities in Finland, there is not a singular Open University institution.

The collaborative basis for out-reach education in Finland, derived from co-operation with existing colleges and universities, meant that open university provision in Finland evolved as a collaborative activity, rather than through an autonomous open university, as occurred elsewhere in Europe. This close association with existing educational institutions also meant that Finnish OU teaching was similar to that in the campus universities, rather than, as in the UK OU, being tailored specifically to promote entry by those with little or no formal education. In addition, the relationship between Finnish OU activities and their constituent university providers is designed to enable students to obtain degrees at the campus based Finnish universities as full time students. Hence unlike Open University students at the UK OU or the FernUniversität (in Germany), or UNED (in Spain), students in Finland cannot be awarded Open University degrees through part-time study.

The provision of OU activities at existing campus based universities in Finland means that conventional face to face contact teaching is most commonly used for OU students. However guaranteeing regional equality of access means that where physical distances and climatic conditions make direct 'talk and chalk' delivery impracticable, tuition is provided through other modes, including video-conferencing and more frequently, the use of web-based environments, which has been aided and accelerated by the high level of information technology in Finland. The new technologies are an integral and dynamic sector of the nation's economy, and their increased use is affecting all parts of Finnish society, including education. Hence audio and video contacts, audio-graphics, radio teaching, hypermedia, electronic mail, the Internet etc., are all playing a major role in improving the accessibility of open university teaching, and enhancing choices of delivery modes for students.

Since the start of distance education, both via existing campus based universities as in Finland, and in separate Open Universities (in the UK, Germany, etc.), considerable expertise has been developed in the production and delivery of distance education, initially in print based format but later in other media such as television. These institutions have also undertaken research into new methods of teaching and learning, including the effectiveness of different pedagogies. Consequently, open universities are the natural and obvious institutions to develop the use of new information technologies, which enable new forms of learning materials to be produced and then delivered anywhere in the world, and synchronous and asynchronous communication between tutors and students, at negligible cost.

Finnish Open University provision has been very successful in enabling 'second chance learners' to get into tertiary education, and has developed in a specific way, reflecting Finnish history and culture. In respect of its contribution to a National Virtual University, the following are worthy of note:

Degree awards - all other Open Universities in Europe provide complete degree schemes, and there is no reason why this should not be the case in Finland, within a virtual university delivery mechanism. Such a development would give the Finnish OU equal status with other national OUs (such as the FernUniversität, UNED, etc.) and give students at the Finnish OU equal status with students elsewhere.

Flexibility to meet Students' Needs - at present Finnish OU students have to complete their studies within a conventional university programme, although their personal circumstances may make continuation of OU tuition throughout a degree programme more preferable - the NVU would enable this to happen.

Collaboration - the Open University provision in Finland grew out of collaboration, which is still a major factor explaining its current strength, hence the virtual university project must ensure that this collaboration is sustained and enhanced. However, "currently the open university system does not form a consistent whole; every university has its own focal areas and modus operandi. This has caused a certain amount of overlap and lack of coordination at regional level,"[118] the NVU could help to overcome these problems.

Promotion of Equality - women account for 70-80% of open university students, and the promotion of gender equality has been a most successful part of OU activities. The continued promotion of equality should be retained as part of the National Virtual University activities.

Promotion of Lifelong Learning - the promotion of lifelong learning requires a more flexible structure and approach than currently exists in most campus based universities. Extending Open University activities and creating a NVU, will inject a new level of flexibility into higher education.

Table 7: Implementation Strategy for a National Virtual University

STAGE 1 NATIONAL POLICY FORMULATION	European and National Government Agencies (Ministries)	Regional/Local Government Agencies	National and Regional Business Consortia	National and Regional ICT Providers (Television, radio, phones, publishers)	University, Open University and Polytechnic Sectors	Academic Staff Associations and Trade Unions	Professional Associations	General Public
Exercise strategic foresight and address implications of possible future global trends	Discussion at European Council of Ministers and National Government level of global social and economic trends	Gather historical data, interpreted at regional and aggregate national level, estimate likely future trends	Gather historical data, interpreted at regional and aggregate national level, estimate likely future economic and labour market trends	Gather historical data, interpreted at regional and aggregate national level, estimate likely future ict trends	Gather appropriate data, interpreted at regional national and international level, provide analysis to extrapolate likely future trends	Gather aggregate data, and provide analysis at national and sectoral levels	Gather data at appropriate international fora	Data gathered via opinion polls and government household and social surveys
Identify European and National Information Society Objectives and Policy Options	Discussion at European Council of Ministers and National Government level of global policy objectives and options	Regional discussions input to national level and European Level via the Council of the Regions	European/National/Regional discussions, input to EU debate via the Economic and Social Committee and to national level via links with national government and parties		Institutional, regional and sector wide debate, academic analysis of policy options and contributions to policy making at regional and national level	Sector wide debate, analysis of impact of policy options and contributions to policy making at regional and national level	Regional/European debates and discussions via professional conferences, journal articles, etc	
Define and disseminate vision, secure consensus	Intergovernmental meetings at EU level, governmental meetings at national level	Disaggregate vision to regional and local level, assess impact, initiate discussion and feedback data	Assess impact at sectoral and company level, initiate discussion and feedback data	Assess implications for ICT suppliers, initiate discussion and feedback data	Assess impact at regional, sectoral and institutional level, initiate discussion and feedback data	Assess impact at institutional level and individual level, initiate discussion and feedback data	Assess impact on national professional qualification structures and training delivery	Institute public debate, assess and feedback public opinion
Refine and finalise national vision, assess macro resource requirements	Receive feedback and finalise vision, assess national resource requirements	Preliminary assessment of regional resource requirements	Assess sectoral and company implications and resource requirements and inputs		Assess sectoral, regional and institutional implications and resource requirements	Assess impact at institutional level and individual level, and resource implications	Assess impact on future job roles and professional training.	Bring vision into the national arena via ministerial press releases, newspaper coverage of government policy.

connectivity) and its higher education provision provide a sound basis on which a National Virtual University could readily be built. Such an institution would promote social welfare, economic well-being and political cohesion at personal, local and national levels. If a NVU is constructed, it would play a significant part in realising the vision currently held by the Finnish Government for the development of an Information Society and a Knowledge Economy within the country, as well as demonstrating across Europe and beyond, that the nation is at the cutting edge and forefront in the use of newly emerging information and communication technologies. The need for a National Virtual University, and the competence to construct it within Finland, are well-established in this paper, along with some indication of what it might contain, and how it might be built. Moreover, as a recent cross-national study of the impact of borderless education observed: "We conclude that 'doing nothing' is not an option for higher education. Courage and creativity will be essential … to rise to the challenges of borderless education."[169] "If any major borderless development is to succeed, the role of senior management will be crucial, and effective leadership … will be needed."[170] However, as befits a flagship project of national significance, the final form of the NVU must be determined and agreed on through a process of widespread dialogue at local, regional and national level, which is as inclusive as possible. The worth and value of this paper will be judged by the extent to which it provides a useful input into that process.

Open Lectures - studia generalia lectures and the University of the Third Age have been undertaken for some time in Finland. The Natiional Virtual University would further extend public access to this kind of lectures / activities. Demographic trends and growth in the use of I.T. in the home and in the regional study-centers mean that these activities are likely to increase, the Virtual University development would enable an extension of OU activities in this area and at minimal cost.

Summary

The history and structure of the Finnish higher education network are distinctive when compared with other European states, particularly in respect of the collaborative aspect of Open University provision and the recent development of the Polytechnic sector. Additionally there are various aspects of the Finnish system which mark it as different from other comparable national systems in Europe and the USA, such as long completion times for undergraduates and postgraduates (especially doctorates), and limited use of both modular degree schemes and accreditation of prior experiential learning.

The national virtual university could build on the strengths of the existing higher education and could also provide a means of levering change to, inter alia:

- *establish a new, fully accredited, NVU able to provide a complete suite of undergraduate and postgraduate courses, award degrees, and compete on equal status with the other European Open Universities;*
- *provide generic "learning to learn" skills, which enable students, both within universities and the community more generally, to engage in the learning process, not just for a degree, but for life;*
- *promote the ethos of lifelong learning as a national policy priority, and provide a tangible and practical way of achieving it;*
- *maximise curricula choice by enabling a modular scheme which allows students to tailor degree schemes to achieve their career aspirations and accomplish personal fulfillment;*
- *enhance equity of opportunity by enabling accreditation of prior experiential learning for mature students who lack academic qualifications;*
- *interface with other private sector and corporate training providers to utilise high quality training outside universities, and enable sharing of best practice between public and private sectors;*
- *enable varying routes for degree completion - via both a conventional university and/or the virtual university, and in full and part-time modes, which could improve completion rates;*
- *enable collaboration in the development of new methods of teaching and learning within the higher education sector and fast dissemination and embedding of new methods across the sector;*

- *enable collaboration in subject based research within the higher education sector and fast dissemination and embedding of research results across the sector, through an electronic library within the national virtual university;*
- *facilitate greater collaboration between industry and higher education via the accreditation of corporate training courses, and the growth in Work Based Learning Degrees;*
- *enhance technology transfer and research dissemination from the h.e. sector to industry through a virtual science park.*

6 Implementation Strategies

The implementation process will vary in accordance with which NVU model is adopted. Clearly, the implementation strategy can only be finalised after the project has been agreed and a project specification produced. Hence this section is indicative and designed to show the bare bones of the implementation process, and also (by relying on successful implementation elsewhere) to bench mark some best practice. This implementation strategy has been created on the assumption that the final NVU model will be that of a National Virtual University as outlined in table 6 (i.e. a fully wired national degree awarding university, with research and technology transfer facilities). Clearly if a lower or higher level model is chosen, the implementation strategy will need to be altered accordingly. The implementation plan will be circumscribed by the form of the NVU, which will itself be defined through an extensive process of dialogue between staff at all levels. As Thompson notes: "It seems axiomatic that information technologies will be highly significant in the delivery of teaching and learning; the real debate is over the issue of 'which sort', with 'when' and 'where' and 'why' being key underpinnings."[167]

Implicit within the implementation strategy proposed here is that the major drivers for this project will be regional learning communities, geographically defined and comprising higher educational providers, local/regional government agencies and business communities. There are five reasons for suggesting the community as the major mode for implementation. First, a devolved structure for delivery can more readily cope with the complexity of a project of this size. Second, the tradition of a consensual approach to higher education and Open University provision in Finland provides a well-tested structure for collaborative projects. Third, there is a well developed literature demonstrating the utility of building regional learning communities.[168] Fourthly, by allowing different regional learning communities to build different parts of the NVU in parallel, there is a greater sense of involvement across the sector, moreover the time taken to complete the project is reduced. Finally, the individual higher educational providers have different roles in accordance with their areas of research expertise, their links with local and national business and their historical development. For example the National Library of Finland is located within the University of Helsinki, and so it makes sound economic sense for the NVU Electronic Library to be developed there.

This paper has outlined the international/national/regional parameters which currently operate and which demonstrate the need for Finland to establish a National Virtual University. Additionally it has been shown that both the socio-economic framework of the country (with its internationally high usage of new technologies as witnessed by, inter alia, mobile phone usage and internet

The success of a NVU will be enhanced if it is well integrated within the local/ regional knowledge economy, and has strong links with other corporate providers within knowledge based sectors.

Both the California Virtual University and the Western Governor's University projects confirm Laurillard's analysis that to make the shift to using new technologies in university teaching successfully requires a quantum leap involving new and different educational techniques and activities, rather than an incremental step premised on re-casting and re-engineering existing teaching and learning practices.

The structure of a NVU will vary in accordance with the functions it is asked to perform, the smaller the number of functions included, the lower will be both the risks involved and the possible returns. Above a certain level of functionality, the returns start to rise steeply and extend beyond the purely educational.

4 Building a National Virtual University

The rationale for a NVU

Before starting to build a National Virtual University, it is necessary to critically consider the rationale for such a project. History has demonstrated that many of the promised benefits of new technologies in teaching (as for example the introduction of television) either failed to materialise, or had significantly smaller effect. Moreover, the adoption of new technologies for learning is a great, and probably irrevocable, step for a university to make, and the risks are heightened if this is part of a national strategy. Hence, close examination of the arguments and issues surrounding the use of new technologies is required to ensure that such a project is viable and fully justified in financial and educational terms. Assessing the impact of new technologies on traditional campus based universities, the Director of the Information Centre of the International Association of Universities found that: "New information technologies, and particular the Internet, in dramatically transforming access to information, are changing the learning and research process, how we search, discover, teach, and learn. … Universities must face up to this challenge. … The future of universities depends on the capability to adapt to the new information society and meet the needs of an ever more demanding professional market."[119]

In her article on *Telematics-Supported Education for Traditional Universities in Europe*, Collis states that there are "three compelling clusters of reasons why faculties in traditional European universities need to re-examine their instructional practices and change their didactic methods."[120]

The Need to Re-Affirm Principles of Teaching and Learning - the traditional instructional methods of most universities are followed without critical appraisal of their raison d'être. The shift to new ict delivery will cause a move from knowledge-based instructor-transmission models to models which are process based and learner-oriented, and involve the construction of knowledge.

Changing Student Demographics - the growing diversity of the student body requires educational programs which reflect this diversity. As Collis states "There are moral, social, and financial reasons to adjust traditional university programs to these increasingly diverse cohorts"

Demands For More Flexible Education -flexibility will be required in:

- **Location** - where the learner can carry out learning activities
- **Programs** - where there will be need to allow a variety of courses in accordance with learners' needs and interests

- **Types of Interactions** - students do not need to always work individually or in groups, and not all the group members need to be in the same place and at the same time in order to learn.
- **Forms of Communication** - within a course learners and instructors will require a wider variety of more targeted and responsive communication than occurs in traditional lectures.
- **Study Materials** - students will need a wider range of choices and modalities from which to learn.

Following the work of Collis, McCormack and Jones (in their book *Building a Web-based Education System)*, pose the fundamental question 'Why Build One?', and look at the benefits and problems relating to the shift to telematic delivery, identifying the following:[121]

Benefits

- **Computer Mediation –** all the information on a course is stored on a computer, so students can adapt the information to their own needs, thus increasing control over their own learning experience. When computer mediation is used in a tutorial, the resultant text can be stored and used directly as a learning resource, which would not occur in a face-to-face interaction. It also enables tracking of student progress and participation which allows staff to generate student reports, identify problems, and tailor the delivery of material to suit individual learning styles.
- **Geographical Independence** - students can study wherever they want, learning is not confined to the physical campus. Additionally, there is no delay in distributing new information to distant students - they can access it as soon as it is put on the website. The accelerating decline in the cost of computing hardware and telecommunications access makes it possible and cost effective to study from home or work.
- **Temporal Independence** - as web based learning material can be accessed anytime and anywhere, there is no need for staff and students to synchronise lecturing timetables. Where asynchronous computer mediated communication is used, this also applies to tutorials and seminars. Students never miss lectures and are empowered by determining when and where they learn. Staff do not miss lectures, and have more time for student support and developing scholarship and research**.**
- **Platform Independence -** many modes of computer assisted and computer based learning are machine specific and may require specific hardware, by contrast the WWW is largely platform independent.
- **A Simple Familiar Interface -** the popularity of the WWW means that many students entering a web-based classroom, already know how to use it. The relative simplicity of the web means that new learners can access packages

Determining which model best fits on to the existing higher education structure, yet also fulfills the aspirations for a NVU to deliver the Information Society, will involve both agreed explicit formal criteria (measurable costs, desirable outcomes) and informal pressures (political acceptance, the push for geographical equity in the allocation of funds). For example it would be possible to conceive a NVU based around the UK Open University and University for Industry models, with a NVU with the ability to grant degrees and commission learning materials from existing universities, who would also provide local tutorial support for NVU students. Within such a model, common subject content would be provided both to students registered to existing universities and studying on-campus and NVU students studying at a distance, based around universal open learning multiple media materials, increasingly delivered via computer, but with students on campus having direct face-to-face support from tutors, while students at a distance communicate with tutors and with their fellow students (located both on and off campus), through new technology. Tutors would therefore have responsibilities for tutoring students registered at the own campus, and those studying via the NVU. Hence the NVU would be different from both a traditional distance provider, where there is no face-to-face interaction with the originators of learning materials (but mediated communication with tutors), and from a campus university in which distance teaching (if it is undertaken at all) is provided as a separate and distinct activity, which runs parallel to the mainstream teaching based on "chalk and talk" delivery, allied to group support through large tutorial and seminar groups. This convergence of what has traditionally been called 'distance' with 'on-campus' teaching provision means that NVU on-line learning and teaching materials are available to both local and distance students through the same Web browser interface in a system of 'distributed on-line learning'. By making these materials available to all students, their average cost per user is much reduced and their educational impact maximised.

Summary

The opportunities presented by a NVU will be best exploited if it covers a full range of university features including (not only) teaching, (but also) research, technology transfer, careers advice, and if it links to local/regional learning communities. Such a university would be a world leader, in that previous projects have been concerned wholly with either teaching (e.g. the CVU) or research (e.g. the Leeds Science Park) but not both.

The experience of the California Virtual University suggests that a collaborative NVU based on existing providers and with a low level of functionality, produces insufficient benefits to be either cost effective or viable, and that the level of financial resources is less significant in determining success than the careful design of the project.

Table 6: The Impact and Costs and Benefits of Possible Types of National Virtual University

Structure	Impact/Costs and Benefits
International Virtual University: all the features of a national virtual university, and linkages to global educational suppliers with cross-national course sharing, virtual student mobility, and the export of courses overseas in English.	Fundamental across global society, providing "cutting edge" multiple teaching and research functions both within the nation state and as a global exporter of high quality education.
	High costs, which are spread across the nation state and international knowledge corporations, but producing additional external high returns in respect of international profile and export of educational goods.
National Virtual University: a fully wired new national university, awarding degrees and networking all existing higher education institutions with home and work locations, facilitating research and technology transfer and linking to other institutions horizontally in the knowledge economy.	Highly significant within the nation state, providing "cutting edge" multiple teaching and research and technology transfer functions within the nation state, and helping to link all facets of social, economic and cultural life within the Information Society.
	Moderate costs spread across the nation state and with corporate partners, but producing economies of scale in educational effectiveness, and significant returns in national prosperity, social cohesion, equality of opportunity, and individual fulfillment.
OU On-Line: extension of existing Open University activities involving new technologies for learning, but leaving degree awarding powers and research and technology transfer functions to campus universities.	Increased equality of educational opportunity, with possibility of enhanced links between universities with greater student choice. Negligible effect on research and technology transfer and the creation of an Information Society.
	Low costs, easily born by the nation state, some economies of scale (dependent on inter-university collaboration) in delivery, but comparatively low returns.
Portal Site: designed as a "shop window" and entry point to existing on-line delivery by conventional universities.	No impact on existing higher education providers or open university provision or but increased access to information for potential students.
	Negligible costs which could be met by the participating universities.

with minimal effort. Moreover the growth of the web into all domains of personal and commercial life, means that skills in accessing the Internet have a relevance beyond education.

- **Increased Communication** - the Internet allows students and staff to talk to each other, individually and in groups.
- **Increased Learner Control** - all the above benefits increase the control of students over their learning experience, leading to increased confidence and motivation.

Problems

- **Access and Resources –** in most Western industrialised nations, access to the Internet is readily available, but this is not the case in less-developed countries. However, the growth of the Internet and computer usage worldwide, means that this problem is fast disappearing.
- **Cost** - for on-campus students, Internet access is included in tuition fees, while those learning at work may also have corporate access at little or no cost. For home-based students the cost of access may be an issue although, as with all aspects of ITC, the cost is declining fast. Hence, web-browsers can now be downloaded free of charge, telephone access is now through a vpop (virtual point of presence) and charged at the cost of a local call, and internet providers (e.g. America On-Line) now offer free access.
- **Training** - although the use of the Internet is widespread, many students will still require some training to maximise its utility.
- **Adapting to New Methods** - the pedagogy required by Web-based learning is different from that currently used in Universities. Staff and students only possessing experience of traditional teaching methods will require training and support to make the shift.
- **Infrastructure, Support and Administration** - a telematic university requires new skills of administrators and managers, who have to deal with new ways of allocating resources and administrative procedures and protocols.
- **No Uniform Quality** - as a technology and an instructional medium, the Internet is still in its infancy. Hence the information it provides is not stable - URLs which may provide supportive material for students may disappear. Similarly, the competition between software companies (primarily Microsoft and Netscape) to achieve a dominant position in the markets for Web browsers and HTML script through product differentiation, may mean that an application which works for one student, may not for another using different software.
- **Copyright, Privacy, Security and Authentication** - the laws on intellectual property rights are currently being re-written in the face of developments arising from ICT, which enables text, music and pictorial and graphical images to be transported internationally at negligible cost. The problems of plagiarism and

authentication of students' work have always existed, but are likely to increase with greater use of ITC in education, although it is also providing an increasingly sophisticated set of tools to identify and combat the problems.

Hence the rationale for individual universities to move to virtual provision is well proven and documented. Assembling a National Virtual University requires appraisal of those factors relevant to individual h.e. institutions, but also has factors other than the purely educational which need to be considered:

Promoting Social, Economic, Political Cohesion and Integration within the Nation - a Finnish National Virtual University will act as a major deliverer of learning, enabling greater access to education, thus improving national economic performance and enabling personal fulfillment. Additionally, by incorporating other activities (like research and development, technology transfer, career development, third age learning) it becomes a vehicle to promote life long learning, and has a major role in building an Information Society in which new technologies form a seamless communication web throughout and within peoples' lives, connecting them in city offices and forest cottages, to work and leisure, to culture and learning, to politics and civic affairs, and above all, to each other. This macro level role can only be achieved by a national level institution, as none of the individual universities have sufficient resources to undertake such a task, and moreover any particular university given the task would be beset by the political problems and institutional rivalries which exist between universities.

Achieving National Priorities - Economic Growth - where individual universities promote economic growth in their local/regional hinterland, this is seen as a bonus to their central raison d'être of education and research. By contrast, a National Virtual University will have a direct strategic responsibility for helping to lever economic prosperity for all, by creating an Information Society and a Knowledge Economy. By extension, a further consideration is the costs and benefits of not investing in the building of a national virtual university. Finland's dominant position in the telecommunications industry is unlikely to be maintained or strengthened without investment of this nature, while the speed of development of new technologies may mean that delaying investment in a NVU may be more costly in the long term, as competitors get further ahead.

Addressing Social Issues - Equity And Opportunities - similarly, individual universities have a responsibility to improve access and maximise educational opportunities but this is subject to their own entrance policy and requirements to maintain academic standards. A National Virtual University will form an active and highly visible part of the national framework for opportunity and access. There are clear social advantages to using new information and communication technologies to meet the educational needs of people who could not otherwise be reached or were unable to benefit from the educational and training opportunities of existing campus based universities.

Business Support And Development	***Business Training and Staff Development***	Joint Accreditation of courses	On-line Vocational Guidance	On-line delivery of shared generic packages required by legislation (health and safety at work, equal opportunities)	On-line courses for basic IT skills and other interpersonal skills	Continuous Professional Updating	Work Based Learning Post Graduate Programs	Student feedback	Preparing for Learning in Retirement
	Business Research and Development	Online MBAs	Work Based Learning Undergraduate Programs	Guests experts speakers from Business and Academia	Business Simulations	On-line Conferences and Seminars	Advice on Grants for investment and training		
	Data Handling	Managing records	Analyzing and tracking students	On line Billing and invoicing	Monitoring Staff Shortages Labour Market Needs				
Career Development Support Materials	***Job Search***	Local/Regional Job Vacancies	Company Websites	Public Sector Websites	University Postgraduate Prospectuses	Voluntary Work Websites			
	Careers and Employment Advice	Careers Planning and Counseling	CV Writing and Job Applications	Interview Techniques	Employment Rights	Coping with Redundancy	Returning to Work	Preparing for Retirement	
Local Virtual Community	***Public Services***	Bus/Train/Plane Timetables	Local Library Online	Local Maps	Arts and Culture	Tourism			
	Local Government	Email to M.P.s and Councillors	Local Virtual Forum	Education	Social Services	Housing	Community Care	Health and Hospitals	Job Opportunities
	Commercial	Online shopping	Job Opportunities						

Administrative Staff Support Tools	***Staff development***	Curriculum Re-engineering	Curriculum Management	Building knowledge and new competences	Team Building	Building motivation	Marketing		
	Administration	Installation	Authorization	Registering	On-line fees handling	Server security	Resource monitoring	Remote access	Crash recovery
Technical Hardware Software Overview	***Server Platform***	Disk Space	Windows NT 4.0 Server	Apple Server	Linux Server				
	Client Platform	Minimum Level	Target Level						
	Pricing	Start-up Cost	On-going Cost	Technical Support					
	Limitations of package	Number of courses	Number of students	Number of connections	Number of instructors	Other Limitations			
Research Environment And Technology Transfer	***Virtual Science Parks (Separate Server space for Technopolis, Medipolis, etc)***	GUI as Physical Metaphor for VSP (sites, buildings, offices, document management	VSP Secure Information Gateway	Data Mining Tools	Organisational Directory	Academic Experts Directory	Research Resources Directory	Virtual Tenant on Unix Server	
	Asynchronous Sharing	E-mail	BBS file exchange	Newsgroups	On-Line Noticeboard				
	Synchronous Sharing	Voice Chat	Whiteboard	Application sharing	Virtual space	Group browsing	Virtual Seminars	Tele conferencing	Video conferencing
	Help desk	IPR Advice	Patents Advice	Partner Search	Advice on Private Finance	Advice on National and EU Grants	Job Vacancies		
	Virtual Research Laboratories And Technology Transfer	Sharing of user facilities, between Universities and Industrial Firms	On line library and information archive	Shared contracts between universities and business	Virtual Exchange of staff, e.g. student placements	Online secure consultation and information exchange	Co-operative Research and Development Agreement		

Ability To Invest And Bear Risk - individual universities are of insufficient size to invest in the large sums required to produce high quality multiple media used for delivery via new technology. As Arbeles observes "the Mega institutions have realised that they need to invest heavily in professionally produced packages. … The high front end capital investment yields a greater return over the time than the current conventional approach of a single professor who must master content, process and delivery. … Capital strapped conventional tertiary institutions are trying to bootstrap into the market place."[122] Furthermore even if individual universities could raise the substantial sums to 'go virtual', the financial risk involved would be very high for a single institution to bear. By contrast, a National Virtual University, would have the ability to raise the large sums required and, with government backing, would be able to bear the risk, as well as negotiate collaborative sponsorship agreements with national and international corporations.

Economies Of Scale - allied to the previous point, a National Virtual University would have the ability to raise the large amount of capital needed to build a virtual campus, and would also be able to gain the economies of scale which are only available when there are large numbers of students able to utilise the learning materials which may be very expensive to create. Additionally, by bringing together geographically separate students within a virtual classroom, the NVU may be able to run courses which individual campus institutions would regard as financially unviable, thus increasing students' choice of courses. Similarly, it is becoming increasingly difficult for all universities to maintain a full stock of academic journals, and more and more publications are now available on-line (such as the Oxford English Dictionary and the Encyclopedia Britannica). By establishing a National Virtual Library to which all students had access, the average cost per user could be brought down.

Protection Of the National University System - American universities and corporations are already gearing themselves to export their products, and their size and financial resources are such they would be able to compete with existing campus based universities, especially where (as is the case in Finland) the population is fluent in English. Tiffin and Rajasingham pose the question: "With the incentive of global markets, we could imagine knowledge-based companies investing in the design, development and marketing of virtual environments in an information society in the way that the giants of the automotive industry now invest in motorcar manufacturing for the industrial society. How could a conventional teacher with conventional resources compete"?[123] Similarly a recent cross-national study noted that "a more direct threat to individual universities is emerging from international consortia of universities or consortia of universities and commercial organisations."[124] The size and the population of Finland is such that only a university built at national level will be able, in the long term, to compete with the growing number of global knowledge providers.

Market Leader In The Global Knowledge Economy - by utilising resources at national level, a Finnish National Virtual University will not only be able to withstand the competition from other global players, it will also be able to enter such markets itself. The very high level of English fluency in Finland gives it a clear advantage in such markets, as does the high level of expertise in ict, and cutting edge technologies such as Wireless Application Protocol. Additionally by having a greater size and scope than existing individual campus based universities, a Finnish NVU would be able to collaborate with other national providers, such as the UK OU, UNED in Spain, the FernUniversität in Germany, who, by virtue of their size and expertise, are able to source money from multi-national agencies like the European Commission, UNESCO and the World Bank.

Protection Of National Culture - the encroachment of the English language and American culture across the world is pervasive and insidious. Nations such as Finland are particularly vulnerable, firstly because there is no one official language - Finnish, Swedish and Sami are all spoken, secondly because these languages are not widely used across the world. Education has a major responsibility in preserving and maintaining the cultural heritage of the nation, more especially in Finland where language and literature have been central to the nation's struggle for independence - Lönnrot's *Kalevala* was of fundamental importance in this respect.[125] By teaching and research, Universities both safeguard and facilitate the transmission of the nation's language and literature, visual, musical and performing arts, and aid their continuing development. Hence Universities act as repositories and guardians of national language, literature and culture (as in the role of the Sibelius Academy, for example), and are icons of the intellectual accomplishments of nation states. Hence a National Virtual University will use new technology to network the nation and protect against further dilution of national culture and language (and the impact of "McDonaldisation"). For the English speaking world such fears may seem overstated, however a recent study for the Foundation for Endangered Languages has shown that every two weeks a language dies somewhere in the world, never to be uttered again, and over 3000 human languages will disappear within a century.[126]

The rationale for a virtual university is well established at micro institutional and macro national levels, and it is evident that the trend towards on-line delivery of education across the world is inexorably upward. However, to ensure that a shift to the use of new technologies in education does not dilute the learning experience, it is essential to ensure that the pedagogies utilised within a National Virtual University are appropriate to the use of these new ways of on-line learning.

Defining the Pedagogy of the Virtual University

Irrespective as to what level or type of technology is used in education, as Clark astutely observed, "Learning gains come from adequate instructional design theory

Table 5: Major Features of a National Virtual University

Intensely Supportive Learning Environment	***Multiple Media***	Real Audio Lectures	Video on Demand	Video Cassettes	Audio Cassettes	CD Roms	Multimedia presentations	Simulations	Pdf workbooks
	Web Browsing	Electronic Library	Search Engines	Dictionaries	Bookmarks	Citation Indexes			
	Asynchronous Sharing	E-mail	BBS file exchange	Newsgroups & Discussion Group					
	Synchronous Sharing	Voice Chat	Whiteboard	Application sharing	Virtual space	Group browsing	Cyber Caf. for informal chat	Tele-conferencing	Video conferencing
	Study Tools	Learning Styles analysis	Learning Log	Tutorial Programmes	Diagnostic Tools	Recording (including note taking)	ITC training	Self-assessment	Group assessment
		Progress tracking	Data Searching	Motivation building	Study skill building				
	Help desk	Subject Tutor support	Learning resources support	Student mentor support	Work based mentor support				
Academic Staff Support Tools	***Student Support Services***	Entry requirements Assessment	APL and AP(E)L Assessment	On-line fees	Course Registration	On-line Course Assessment	Online Counseling	Virtual mobility	Careers Advice
	Curricular Design	Course planning	Course managing	Course customizing	Course monitoring				
	Unit Development	Instructional designing	Presenting information	Delivery Testing	Assessment strategies				
	Quality Monitoring	Instructional design protocols	Results monitoring	Student feedback					
	Data Handling	Marking on-line	Managing records	Analyzing and tracking students	Data base of Alumni				

to benefit from economies of scale and critical mass when they are being built and, given that in the long term only one platform will predominant, will be poor value for a high level of government expenditure. However, the NVU must be able to utilise the strengths of existing university and polytechnic networks and the collaborative networks which have grown up through the work of the Open University activities in Finland. On the basis of the CVU and WGU models, and the discussion of the Finnish higher educational system the following table provides a description of the type of elements a Finnish NVU might include.

Clearly the extent to which the features in Table 5 are adopted in building a National Virtual University, depends on which of the models of the NVU outlined above is chosen by the stakeholders. The nearer to the adoption of a Portal Site, the fewer of the features in Table 5 that will be incorporated in the final model, while if all the features of Table 5 were adopted, the resultant structure would look more like a National Virtual University as described above. To try to assess the relative merits of the various options, Table 6 summarises the features of various models of virtual university, ranging from a Portal Site to an International Virtual University, and their associated impacts and costs and benefits.

and practice, not from the medium used to deliver instruction."[127] New technology provides opportunities for educators entering the global on-line era. However, the creation of a new learning environment built on new technologies must be grounded in the appropriate pedagogic theories and the educational structures derived from them, which relate to these technologies. The impact of these technologies is such that old pedagogic models (even those relating to distance teaching) are no longer appropriate. As Skolnik (quoting Barr and Tagg) makes clear: "To build the colleges we need for the 21st Century …we must consciously reject the Instruction Paradigm and restructure what we do on the basis of the Learning Paradigm."[128] Similarly Sir John Daniel, Vice Chancellor of the UK OU warned about the costs universities in the USA would incur if they failed to adapt distance education to new technology thus: "I do not dispute your rights as Americans to define distance education as you like, even if you differ from the rest of the world. However, your current conception of distance education is not just a harmless deviancy. It prevents you from reaping the benefits of a revolution in higher education."[129]

However as David Hawkridge observes "there is widespread ignorance concerning how best to exploit the new media,"[130] moreover, computer based learning has been widely criticised for using poor teaching strategies, Van der Brande, for example, claims that "only 3 per cent of educational software has been written in the context of an articulated pedagogic rationale,"[131] while Speke and Powell are more overtly critical and characterise most of the available multimedia materials as 'multi-mediocre' or 'awfulware'.[132] All would agree with Reusser[133] that the design of a computer-based instructional system should be based on the content specific research of learning and comprehension, that is, the pedagogical model of the learner and the learning process. Thorpe argues that "We need to develop procedures and approaches which generate learning and develop self-aware learners and which also avoid either giving learners all the responsibility and no power, or leaving then to sink or swim. It will not be enough merely to provide the extensive multimedia resources which are being introduced in many institutions of higher education."[134] The use of ict in learning requires academic and learning support staff to re-think the nature of higher level learning, because, as Brittain et al have argued, it fundamentally changes the relationship of the learner to his/her university, tutor and learning materials.[135]

New technologies have changed distance teaching so that it now requires a new approach, which is what prompted Diana Laurillard, (ProVice Chancellor for Learning Technology and Teaching at the UK OU, which was the first of its kind and remains pre-eminent) to devote a entire book to *Rethinking University Teaching*.[136] Laurillard's basic premise is that "teaching is a rhetorical activity: it is mediated learning, allowing students to acquire knowledge of someone else's way of experiencing the world" in which the learning process is constituted as a dialogue between teacher and student. Hence "for learning to take place, the core

structure of the conversational framework must remain intact in some form,"[137] and computer mediated communication (CMC) enables this conversation to take place. Similarly Chambers argues "if one accepts the basic premise that the fundamental purpose of higher education is not the transmission of information but the acquisition by the learner of critical thinking skills, then it follows that the new digital learning media should be used in a manner which best facilitates a discourse between the learner and his or her mentor, rather than a one-way transmission of 'facts'."[138]

Hence, the changes required within the telematic pedagogy are not to do with supplying content in multi-media format via the web, (which is little different from supplying content by CD-ROM), but centre on computer mediated communication. As Laurillard points out "Stand-alone media-based packages will never be sufficient, because none of the media can adequately support the discursive activities that are essential for academic learning."[139] Bates[140] identifies the two crucial features which distinguish Computer Mediated Communication (CMC) from Computer Based Learning. First, CMC enables all learners to be in contact with each other and with their tutors as they enter a collaborative learning process – whereas previous cbl and distance teaching is premised on independent individual learning. Secondly, CMC means that students can access remote databases and download information into their own, and their tutor's own, computer, including subject content and textural messages. Hence students ***deal individually with*** the computer to obtain content information via cbl, but they ***interact collaboratively through*** the computer via CMC with other people and supplementary sources of data.

These two aspects of collaboration and interaction which CMC enables are ***crucial*** to the educational effectiveness of new technologies, and ***not*** the ability to provide subject content via the WWW unaffected by time and place. As Reeves demonstrates "there are still misunderstandings among higher education personnel about the potential of the WWW to support learning. As with previous innovations such as interactive multimedia, many faculty assume that the WWW is a 'magic box' and that simply putting a course on the Web guarantees better learning. (hence) …once instructional materials are on the Web, students will learn automatically. Actually, the WWW does not guarantee learning any more than the presence of a library on campus guarantees learning."[141] In this respect Sir John Daniel's warnings are pertinent: "Much of the commercial hype and hope about distance education is based on a very unidirectional conception of instruction, where teaching is merely presentation and learning is merely absorption. The Open University's experience with two million students over 25 years suggests that such an impoverished notion of distance education will fail – or at least have massive drop-out problems."[142]

Hence it is necessary to create a new structure in which the telematic, rather than the face to face, delivery mode is the norm for all staff;

- telematic delivery offers the potential to re-configure the learning process and move from an instructionist to a constructionist mode which is student centred.

Most crucially both the CVU and WGU experiments demonstrate that on-line learning is not merely an incremental step - those looking at online learning have to understand that they are not looking at new ways of doing what they have always done, but rather, that they are looking at doing **new things**. Online learning enables university staff not only to place texts and other materials on computer screens across the globe via the internet, it also allows university lecturers and students to use better and cheaper modes of communication. Hence it permits the **reshaping of learning**, and the end of inefficient broadcast modes of teaching, as the age of interactive learning comes into its own. Within this new paradigm of interactive learning, academics will have to surrender their traditional monopoly while students will have to surrender the "security blanket" of traditional passive instructional modes of delivery. Endorsing these views, in a speech delivered in Nova Scotia, Sir John Daniel stated "The knowledge media are not just a technical format, such as CD-ROM or computer conferencing, but the whole presentational style, the user interface, the accessibility, the interactivity. For our ability to transmit and manipulate symbols the knowledge media are such a quantitative advance, such a quantum leap, that they represent a qualitative change. Complacency is not in order. This is going to change universities."[165] Similarly Otto Peters, the Founding Rector of the FernUniversität, has opined that "If the university wishes to prepare itself for the tasks facing it in the future, it is not sufficient for it to regard the new technologies merely as additional media units and to misunderstand them as an extension and extrapolation of the previous familiar reaching operation … In concrete terms we are witnessing the change from traditional on-campus teaching to that of a university without walls; from a university that remains closed to many, to an open university; from an exclusive system of teaching and learning to an inclusive system."[166]

Determining a Virtual University Model for Finland

In designing a NVU for Finland there is a basic paradox which needs to be addressed. It is necessary to design a structure which can maximise the benefits of the use of new technologies to higher education in the most cost efficient way. The CVU was allocated $16 million for online learning, and six million for CVU, and went bankrupt, but the state of California, with a population of over 30 million people, was able to absorb this loss. Finland's population of circa 5 million may be less able to cope with heavy losses of an ill-conceived NVU project. Clearly, for example, developing parallel virtual structures in university and polytechnic sectors will make an overall national delivery pattern less likely, will be less likely

institutional autonomy to set its own direction or develop policy appropriate to its medium. Hence for a National Virtual University to flourish in Finland (or elsewhere), first, its relationship with industrial partners needs to be agreed and accurately defined, secondly, in recognition of the requirements and opportunities afforded by the use of new technologies in teaching, the NVU needs to be a separate entity from the existing higher education provision.

The other major virtual university experiment in the USA has been the Western Governors University. The Western Governors University was started in June 24, 1996 as a self-supporting non-profit corporation, unusually it offers a competence based approach and does not focus on the number of credits a student has accumulated but rather it certifies the competencies or learning outcomes that the student can document or demonstrate. Courses and programs were first offered in August, 1997 and although the WGU has fared better than the CVU, by 2000 enrolment was still slow.[163] Comparisons between the WGU and the CVU explore some of the reasons why the CVU failed. As Berg indicates the CVU "is obviously much more conservative and anchored in the control of the existing educational institutions with its faculty governance schemes. Under this model, technology will be used to augment traditional classroom courses and probably only have widespread use through continuing education."[164] Additionally Berg noted that the WGU sought separate accreditation while CVU deferred to the sponsoring university for credit. Hence the major difference between the two projects is that students in the Western Governors 'distance learning' program receive credits from the newly created 'WGU,' while those studying via the California linkup were to receive credits from participating institutions.

There was widespread agreement that the California project failed because it did not move to a completely student-centred paradigm, but instead was a collaborative venture using existing providers that did not provide any "value added." Hence this necessarily gave California's project less impact because students were not be able to complete a degree through the virtual university, only through individual institutions. In respect of devising a NVU for Finland, what can be learnt from the experiences of the California Virtual and the Western Governors University?

- a high level of financial resourcing may be less critical in producing success than a properly conceived organisational plan, which addresses the new opportunities for students provided by virtuality, by adopting new learning environments and the pedagogies associated with them;
- a virtual university organisation based on existing structures is less likely to succeed, because it requires collaboration between current educational providers (who are likely to be in competition);
- existing providers are unlikely to possess the managerial capacity to overcome resistance from existing academic staff and get them to shift away from course delivery based on face to face lectures towards telematic delivery via ICT.

For Laurillard the learning process must be constituted as a dialogue between teacher and student, which has the following characteristics:

Discursive

- Teachers and students conceptions should each be accessible to the other.
- Teacher and students must agree learning goals for the topic, and task goals.
- The teacher must provide an environment within which students can act on, generate and receive feedback on descriptions appropriate to the topic goal.

Adaptive

- The teacher has the responsibility to use the relationship between their own and the student's conception to determine the focus of the continuing dialogue.

Interactive

- The students must act to achieve the task goal.
- The teacher must provide meaningful intrinsic feedback on the actions that relates to the nature of the task goal.

Reflective

- The teacher must support the process in which students link the feedback on their actions, to the topic goal, for every level of description within the topic structure.

Laurillard's study is not a theoretical exercise, but uses studies of student learning to develop a methodology for the design of multimedia teaching that builds on what is known, and then applies the methodology to the whole academic system. In undertaking this process, Laurillard specifies the key assumptions which underwrite the resultant system, these are:

- **Quality is best established through organisational infrastructure and collaboration**. As Bates[143] argues, the high cost of developing good quality multimedia shows that a collaborative approach is most effective.
- **Design must address the entire learning process** – new technological methods of teaching cannot be introduced in isolation or as an incremental addition. Designing the course material must come after the overall learning paradigm has been specified, and the delivery of content via multi-media and the WWW must conform with known research on screen design to aid distance teaching utilising CMC.
- **Organisational infrastructure must be cyclical to ensure improvement** – the 'goal-action-feedback-revise action' cycle should be evident at all points in the organisational process.

- **Implementation must address the context of learning and teaching** – all aspects of the academic function – teachers' attitudes, course scheduling, administration, technical and academic support, assessment modes, must all be conducive to enabling students to use the new technology.
- **Academic knowledge is different from experiential knowledge** – new technology tends to support a fragmented, informational view of knowledge, but academic knowledge has an integrative character, which is distinct from information. This philosophy of the integrative (rather than informational) view of knowledge must be built in to the design process of distance teaching courses delivered via the www, before the units are created, not after.

Laurillard is explicit that students' use of technology must be an integral part of the student experience. Hence an organisational approach must be adopted, in which "teacher's attitudes, other course teaching, scheduling, logistics, administration, briefing and de-briefing, technical and administrative support and student assessment must all be conducive to enabling students to use the new technology to the full. If they are not, it will fail, no matter how good the material."[144] Similarly "the most important key to the successful integration of technology into the teaching and learning process, and essential for supporting both faculty and student use, is to carefully modify the curriculum to include specific technology appropriate activities. In particular new tasks must target core components of the curriculum rather than represent superficial add-on tasks. The incorporation of specific tasks within the core curriculum has been shown to be a critical link to whether an institution will successfully use technology."[145]

Laurillard's framework provides the shell within which a NVU could be built. It does not, however, provide the fine detail required to finish and equip the building and make it operational. The success of a National Virtual University will depend on the extent to which it is an integrative environment - the way in which the curriculum is re-engineering, the level of staff development provided, and the process of implementation will all help determine the success of the enterprise. Within the new environment, learners will interact with new technologies in a various ways, determined by the nature of the learning task, and their preferred style of learning. These styles will vary considerably, both between and within individual learners, depending on the nature of the task. Modern learning theories emphasis the importance of context and collaboration when integrating technologies in learning.[146] Bates[147] suggests that the resultant learning context will need to include the following:

- Working alone, interacting with learning material (accessed locally and/or remotely).
- Working collaboratively with fellow students at different sites (local and remote) either synchronous or asynchronously.

Adopting the California model, applying the use of new technologies to integrate all programs and activities on a campus based university for delivery, pedagogic support, learning support and management of teaching, financial and administrative functions, results in a new category, a virtual university in which communication and information technologies integrate all university functions and services including:

- teaching, tutoring, and assessment;
- coaching, libraries, academic offices;
- learning materials provision;
- communication, co-operation, group work and social networking;
- all kinds of knowledge and information flows;

with the result that all learners (both those studying conventionally on campus and those using open learning off campus) receive only marginally different learning experiences, and have a maximum of flexibility and independence with individual, personal support and coaching.

However the Californian model has limitations when compared with a NVU. For example, there is no attempt to address the research function of the university within the CVU, or to replicate physical structures which link universities with their business and commercial hinterlands (such as Science Parks or Technology Transfer companies). Moreover, the CVU is separate from, rather than integrated with, other facets of the knowledge economy, and there no attempt to make the CVU part of a local/regional learning community, involving other training providers, or local and regional government. The California Virtual University failed despite the fact that the State Governor won $16 million for online learning, and spent over six million on CVU in particular. By April of 1999, the dream lay in ruins - all that will remain is a listing of online courses and programs offered by other California institutions. CVU's plans for an virtual library and online guidance and counseling service were shelved, and staff were laid off. The failure affected online learning in general, as CVU was seen in some quarters as a model for the future. One of the major problems was that CVU did not actually create online courses - it only catalogues them - it had no design or delivery expenses so that under CVU individual institutions design and deliver their own online courses

Another aspect of the CVU plan, which is worth considering within the Finnish context, is that one of CVU's primary parameters was a partnership between industry and education. Hence Sun Microsystems, Microsoft, Pacific Bell, KPMG Consulting, and International Thomson Publishing were all involved in the venture and it was planned the companies would take over the CVU's computer and telephone systems, and share profits from services such as computer support, pagers and Internet access, however by April 1998, Microsoft had pulled out. A major cause of the failure lay in the way that the CVU was structured. CVU was dependent on the traditional member institutions to provide courses and grant the degrees, as a result it did not have the

were identified as having an important impact on quality with large scale distance education delivery using new technology:[162]

- **Maintenance of Currency of knowledge and skills** is essential in the information age with the explosion of knowledge and the impact on the application of the knowledge. Largeness of scale spreads the responsibility for currency across all the universities involved in a collaborative way.
- **Faculty Support Services** are as essential in distance learning programs as student support services. Small scale learning programs often lack the necessary critical mass of academic staff to make support services efficient.
- **Program Evaluation** is critical to the quality of all academic programs, large scale education programs provide participating universities with the opportunity to draw from the best of evaluation criteria and a critical mass of data to analyse.
- **Library resources -** are essential and more effective and cost efficient in a collaborative multi-campus system where responsibilities can be shared.
- **Marketing and Recruitment** of a critical mass of qualified well-informed students is essential in the success of distance learning courses. Where advertising web pages are accessible to a large audience campuses are motivated to guarantee accuracy and can benefit from a large pooled marketing effort.
- **Student ability** to deal with the technology is enhanced through shared responsibility for the development of training materials and robustness of technical support.
- **Cost effectiveness** requires large numbers of students to be recruited in order for the costs of materials of development to be covered.
- **Faculty Training and development** required to deal with the use of new technology can best be developed and delivered in a highly collaborative multi-campus project.
- **Long range planning, budget and policy development-** for such a large and innovative project are best undertaken in a collaborative environment.
- **Interaction between staff and students -** is essential to the success of distance provision and minimisation of student drop out, the communication system must ensure that distance students are not isolated but staff are not overwhelmed by messages from students.
- **Faculty responsibility for the educational process -** the technology must ensure that faculty remain responsible for quality assurance within academic programmes.
- **Choice of Technology -** is crucial to all virtual university projects, multiple media to enable many learning choices and the ability for computer mediated communication between faculty and students is paramount.
- **Student assessment -** has a tendency to become fragmented and uncoordinated.

- As an 'apprentice' or 'student' working with a more experienced supervisor or instructor.
- As an instructor or supervisor working with (and for) less experienced colleagues.

Within this learning context, an array of material will be needed in various formats, to address the learning styles of the students and the particular task. As Sumner and Taylor[148] suggest, the approach should be that of media complementarity with the use of multiple media, ***rather than*** multi-media. In their study of the problem of combining online and offline learning within a homogenous environment, Nemirovski et al agree that the World Wide Web creates a new starting point which "keeps the advantages of conventional CBT courseware, and at the same time succeeds in overcoming its restrictions."[149] However, they note that there are various models of online universities and virtual learning environments, each using a different concept, and this absence of a common approach makes it difficult for academic staff seeking to re-engineer existing materials for distance or on-line tuition. This problem is further compounded by the fact that (as Collis notes) "many (outside of faculties of education) may not be aware that there is an extensive base of theory and research related to the science of teaching and learning in higher education and thus can benefit from becoming more aware of certain key principles."[150]

Computer Mediated Communications

The major advance from the use of ITC in teaching is not the delivery of web-based subject content. The functionality of learning packages provided by on-line subject delivery is little different from that provided by CD-Rom. In fact CD-Roms may be more user friendly where the connectivity speed and download time for large files (using video/audio clips or graphics) from the Internet may be prohibitive or disenchanting for on-line learners. Where new technologies are significant is through computer mediated communication, which enables tutors and students to communicate, in real time and asynchronously. Just giving learners the chance to use email or a conferencing system does not guarantee productive or interactive discussion, hence it is necessary for the tutor to initiate the discussion[151] - Kerr emphasises that it is "the nature of the medium" that creates the "need for strong and active leadership" and that "unless a moderator sets an agenda and keeps the group working towards its goal, nothing much will occur."[152] Hence, although the anonymity of web based collaboration can encourage reticent learners,[153] it is usual to require students to provide a minimum number of postings each week.[154] When considering the use of CMC as part of programmes offered to overseas students, one of the major advantages reported is that "text based media … facilitate interaction for those using their second language. … (as) ... Most people are more able to write than speak in another language."[155] Lack of

confidence by students in their pronunciation of a second language is no barrier to interaction when it occurs in written form, rather than verbally and orally.

Re-styling the process of tutorial support presents the greatest challenge to academic staff, as they construct curricula to take advantage of new technology.[156] As Bates acknowledges, "it is just as much a challenge to prepare instructors, tutors and students in the design and learning requirements of CMC. Instructors need to develop skills in identifying the role and purpose of discussion, criteria for assessing the quality of discussion, skills in helping students to participate constructively, and the ability to construct an integrated curriculum that combines CMC with other media."[157] However, Mason comments that "Most teachers who take on the challenge of teleconferencing, particularly those who develop collaborative learning strategies for their courses, report tremendous satisfaction … The reward lies in their sense of working towards the goal of developing independent questioning learners. Almost all find that using these technologies is a tremendous learning experience for themselves."[158]

Summary

Although there are risks and costs as well as benefits from investing in a National Virtual University, the rationale for moving towards use of new information technologies in higher education is well established at both within individual h.e. institutions, and at national level.

Additionally, undertaking the virtual university project at national level enables benefits other than the purely educational to be gained, more particularly the creation of a knowledge based economy, the promotion of social cohesion, the protection of the existing Finnish university system, and the preservation of language and culture.

Within any NVU, the new mode of delivery requires a quantum leap rather than an incremental step in the design and development of a new teaching and learning methodology, which is discursive, adaptive, interactive and reflective.

Although the development of web-based learning packages will take place within the NVU, the major development within the new instructional mode is the use of information and communication technologies to enable learners and tutors to communicate with each other, and it is the change in the nature of the supportive role of staff, through computer mediated communication, that will be crucial in the development and success of the NVU.

First, they are largely American, rather than European or world-wide. Although there may be other providers elsewhere, it is significant that Robin Mason's recent survey[161] (which was initially conducted on behalf of her employer, the UK Open University) did not highlight any serious contenders. The Global Virtual University Alliance may be the only European contender, and is still in the planning stage, but over the next decade the European Open Universities will either join the proposed Global Virtual University Alliance or some similar provider. Secondly, very few (if any) of these providers have yet managed the transformation into collaborative global providers of joint- accredited degrees. Although this will be much harder to achieve, it is here, in providing wider students choice, that greatest gains may be made.

In essence "gateway" sites offer faster access to existing programmes, rather than access to new cross institutional programmes. Compared with what a Finnish NVU project might offer, the competitors are weak as they are both predominantly American based, and are largely catalogue websites only. However, they have the benefit of having got to the market first, developed critical mass, and got company sponsorship. The likely response of competitors to a Finnish NVU project would be to try to develop critical mass by signing up other providers worldwide, but this would require substantial alteration in their product focus – given that most of them emphasise their geographical location and area of operations (e.g. "Western", "California", "Colorado"). The difference with the Finnish NVU is that it could be globally based, and could lead to cross curricula and multi-institutional programs. In the longer term, competition between the Finnish NVU and other European NVUs may be stronger, given that cross national collaboration already exists (between, for example, the German speaking states), and that funding from the European Commission may be available.

Lessons from Previous Virtual Universities

The apparent shortcomings and deficiencies of previous virtual university models, and failures of previous attempts to build virtual universities elsewhere indicate both the extremely high economic and political costs of making mistakes and, by extension, the need to consider very carefully what the NVU should include and how it should be constructed. The California Virtual University (CVU) was one of the earliest, and has become possibly the best known. The CVU Design Office conducted an audit of h.e. institutions in the State and received data from 154 campuses, covering 1,468 individual courses with 51,262 students. Clearly the scale of this operation is such that it provides a useful exemplar for a national virtual university. Hence data from the construction of the California Virtual University provides a useful comparative lesson for constructing a Finnish NVU. The starting point and major factor in the design of CVU was ensuring high quality of provision in spite of the large scale of operation. The following factors

- **National Government:** with whom political priorities (such as retaining power) are often paramount;
- **Government agencies**: who need to consider integration with other (possibly competing) policy priorities, and will be required to create implementation structures;
- **Business Communities**: who may have existing research collaboration with universities and be asked to invest in virtual universities and may also have corporate university aspirations;
- **Higher Education Providers**: who may consider a national virtual university as a threat to their research and teaching functions, student numbers and income streams;
- **Academic Staff Trade Unions**: who may see national virtual universities as threat to staff by changing their functions or even replacing them;
- **Students**: who may view on-line delivery as a cheaper but less satisfying way of learning.

These considerations suggest an incremental approach to the project, starting with an extension in Open University activities, then moving towards a nationally linked unit, before finally extending the service outward. Such a move would enable staged formative evaluation of the project during its life time, to enable strategic changes to be made, allow early exit from the project if it becomes unviable, and aid cost effectiveness by avoiding the spiraling costs often associated with very large, long timescale public sector projects - in the UK for example, the initial cost of the Channel Tunnel was $9 billion, but the final bill came to $13.5 billion. Hence the initial stage would be to extend the delivery of Open University provision in three complementary directions:

- to all higher education providers, and even into the work place;
- horizontally, by allowing a modular course matrix to enable wider student choice and the development of new inter-disciplinary courses;
- vertically, so that students can get an OU degree, rather than just entry into an existing university, as at present through OU provision.

Universities and nation states alike, seeking to build virtual universities by benchmarking best practice elsewhere, soon discover that although much has been written about introducing new technologies and new learning environments to individual universities, there are few guiding examples for building a virtual university network or a national virtual university. Nevertheless, it is worth looking at what has already been attempted elsewhere, in terms of identifying best practice, and assessing the likely competition. There are already electronic online College "gateways", which will act as competitors for the project, and Appendix 2 contains a "thumbnail sketch" of the main competitors. Two things are notable about these.

5 Possible Structures for a National Virtual University

Building on Existing Strengths

On the basis of the previous analysis of the Finnish situation and the rationale for a NVU, it is possible to examine the structures which could be included in a Finnish National Virtual University. The diagram in Appendix 1 provides an initial estimation as to the basic bones of such a structure, which is built upon, and derived from, the existing pattern of Finnish higher education provision. Clearly, in the initial stage not all of the proposed functions will be available. However, to maximise both the integrative aspects of the various functions which a national virtual university could provide, and the available outputs from such a development, it is necessary to consider all desired final elements at the initial stage. Hence the final diagram includes:

- a Virtual Science Park;
- an Electronic Library;
- a Careers Advice Service;
- local government and community learning links;
- links with business;
- on line shopping such as an academic book shop;
- social facilities - an on-line, virtual sports arena (with video games) or even a virtual sauna (a bulletin board or cyber café in which messages could be left anonymously).

Virtual Science Parks are still in their infancy, but early work demonstrates their potential for encouraging collaboration and technology transfer between universities and business. The first Virtual Science Park was constructed in the UK by a specialist team of computer and social scientists at the University of Leeds to integrate existing disparate activities occurring in key UK universities within a large and well -developed local urban economy, through collaboration with a strong team of industrial partners. The Virtual Science Park is a person-centred desktop computer-based system which includes:

- a structured information model that generates a directory of the resources available in the Science Park (organisations, experts, resources);
- search and browsing systems that allow navigation through the resources of the Science Park and access to an information gateway;
- tools for mining and integrating existing information sources;
- an integrated set of communication tools including desktop-to-desktop video-conferencing;

- a link through World-Wide Web to the Internet;
- document management facilities.[159]

The UK pilot project focused primarily on a locally based economy, but subsequent projects have scaled up the virtual science park in size and scope. The city of the Hague, working within the framework of the INFOCITIES project, co-funded by the European Commission's DG XIII, has initiated A 'Virtual Science Park' that links together firms in one area of the city to stimulate business-to-business electronic commerce and networking. Firms are eligible for subsidised charges for connection, usage, consultancy and training. A mobile demonstrator of the benefits of telematics technologies for local SMEs, is housed in a converted bus (the "Internet Bus"). A journal for SMEs developed in partnership with the local cable company (CASEMA) and a local content supplier (Infothuis) is available over the cable network. Similarly, the City of Barcelona has created NetActiva, the first virtual business incubator in Europe, in which a technological platform of contents and services for new businesses and SMEs form an interactive virtual business community for the creation of collaborative networks that promote collaboration and innovation.

Work undertaken by Kaukkonen and Nieminen[160] on Finnish technology transfer, points to the perpetual problems faced in a small country like Finland, firstly, in trying to strike a balance between national R&D interests while focusing on international developments in research and development, and secondly, the dilemma of choosing between the selective concentration of resources in areas of key strength and the national belief in equality of opportunity. Further they point to lower levels of collaboration between interdisciplinary (academic) and intersectoral (governmental) arenas, when compared with the links between government and industry and between companies within industrial sectors, both nationally and internationally. Some of these problems could be addressed by a Science Park operating within the Finnish NVU.

Similarly, the National Virtual University project could link information sources for the local community. The cities of Espoo (http://www.espoo.fi/espoo/index.htm), Helsinki (http://www.hel.fi) and Tampere are already part of the Euro Cities Network, and are seen to be pre-eminent in this use of technology. The Local Community area of the NVU could utilise and build on this expertise by providing common information platforms for all the major urban areas in Finland.

The structure of a national virtual university will be determined by the functions it is asked to perform. Clearly a virtual university designed to enable the export of courses across the globe will vary considerably from an institution designed for the home market. Hence the complexity of the structure will increase along a continuum between:

International Virtual University: providing all the features of a national virtual university, but with the potential to link up with global educational suppliers and enable cross-national course sharing, virtual student mobility, and the export of courses overseas.

National Virtual University: a fully wired new national university, able to award degrees and networking all existing higher education institutions with home and work locations, and also linking to other institutions horizontally in the knowledge economy supply chain - i.e. backwards to providing pre-entry information (course entry requirements, APL and APEL, etc.) and forwards to offer post-graduate support (career guidance and counseling, job advertisements), and life long learning with continual professional updating and work-based learning, as well as the University of the Third Age and facilities for those in retirement.

OU On-Line: an extension of existing Open University activities involving new technology, including t.v. and satellite delivery, electronic libraries, but not threatening the core business of conventional campus based universities.

Portal Site: designed as a "shop window" and entry point to existing on-line delivery by conventional universities.

Other considerations will also impact on the structure adopted for a virtual university including:

Cost - the cost of building a fully operational international virtual university may be either too large a fiscal burden, or too risky an enterprise. It is worth noting that the California Virtual University went bankrupt, while Western Governor's University (with which the UK OU was involved) experienced severe problems despite very large financial resources;

Flexibility - the rate of change of new technology is such that any plan to build a large organisation on the basis of existing technology is bound to require substantial revision before it is completed;

Existing delivery configurations - geographical, demographic and socio economic features may make it too costly to provide virtual university provision across an entire nation state, especially if there is low demand for courses in sparsely populated areas, or if the ICT infrastructure is too costly to install. Additionally, the need for real (rather than virtual) facilities for students, may make it more cost effective to cluster activities around existing learning providers (groups of universities and/or polytechnics) to create learning communities.

Stakeholder Concerns - to successfully build a national virtual university will require that all stakeholder groups are fully consulted, and there is a consensus over the structure, and speed and mode of implementation. The stakeholder groups for a national virtual university will include: