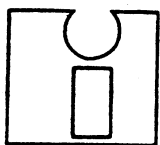


WIPO/IFIA/BUE/00/4.a

ORIGINAL:English

DATE:September2000



INTERNATIONALFEDERATIONOF
INVENTORS'ASSOCIATIONS
(IFIA)



WORLDINTELLECTUAL
PROPERTYORGANIZATION

INVENTORS AT THE DAWN OF THE NEW MILLENNIUM: WIPO-IFIA INTERNATIONAL SYMPOSIUM

organized by
the World Intellectual Property Organization (WIPO)
and
the International Federation of Inventors' Associations (IFIA)
in cooperation with
the Government of Argentina
and
the Argentine Association of Inventors (AAI)

Buenos Aires, September 5 to 8, 2000

HOW THE INTERNET AND NEW INFORMATION TECHNOLOGIES INFLUENCE
THE WORK OF INVENTORS, INNOVATORS AND INNOVATIVE
SMALL AND MEDIUM ENTERPRISES (SMES)

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Synopsis

This paper seeks to highlight the importance of technology as a driver of economic growth and the linkages between innovation and the emergence of Internet. It brings out the way the new information technologies are providing the competitive edge to enterprises. The fast -changing nature of technology and the emergence of knowledge societies are explained with the historical backdrop of cycles of technological innovation. The process of technological development and the paths in innovation are highlighted to stress the importance of an enabling environment in which creativity and innovation can flourish.

The influence of the Internet and new information technologies is illustrated with reference to the opportunities and strategic advances particularly for small and medium enterprises (SMEs).

Introduction

There is overwhelming empirical evidence that the per capita economic growth of countries is driven by innovations, not by aggregate capital investment per se. Technology is indisputably the engine of growth.

The purpose of innovation is to create a new value, be it for individuals, teams or organisations or for society at large. Value creation could take the form of a breakthrough of products or services, of new strategies, of a new process and of new methods of organization.

Innovation is usually thought of as the creation of a better product or process but it could just as easily be the substitution of a cheaper material of an existing product or a better way of marketing, distributing and supporting a product or service. Though the notion of innovation lacks a rigorous definition, an nation's ability to convert knowledge into wealth and social good, through the process of innovation, is going to determine its future. Economic knowledge, more than mere capital or natural resources, will dominate this century. Knowledge, embodied in new ideas and inventions, stimulates even the traditional industries to become knowledge driven. Tomorrow's society will be a knowledge society. Tomorrow's markets will be knowledge markets. It has been said that tomorrow's wars will be fought not by the use of conventional weapons but with the new thermo-nuclear weapons called "information and knowledge". The idea that intellectual property is an asset with definite commercial value is growing significantly.

The advent of the Internet and related technologies, linked with changes in telecommunications has thrown up new opportunities and has brought the importance of size in competitiveness of firms into question.

The Course of Technology Development

Understanding the effects of technological progress on economic growth was spearheaded by the Austrian economist, Joseph Schumpeter, who pointed out that a long upswing in a cycle starts when a new set of innovations comes into wide-spread use. This happened, in the late 18th century with water power, textiles and iron; in the mid-19th century with steam, rail, and steel; and, at the turn of the 20th century, with electricity, chemicals, and the internal combustion engines.

By the 1950s, the third cycle of these successive industrial revolutions had already run its course. The fourth, powered by oil, electronics, aviation and mass production is winding down. There is evidence that a fifth industrial revolution based on semi-conductors, fiber optics, genetics and software is not only well underway but has, possibly, run two-thirds of its course and may be approaching maturity. The long economic waves are shortening from 50-60 years to around 30-40 years. Government and companies preoccupied with preserving their fourth wave industry may well find themselves as laggards.

Over 50 years ago, before World War II, the driving force for innovation was only a few small enterprises. World War II and the years thereafter witnessed the emergence of government-funded research, driven by the demands of economics, defense and health. After the Cold War, defense-based science and technologies declined. Economic growth and health became prime movers.

Paths in Innovation

Three approaches are visible:

- The first is innovation on a large scale. They take the form of strong social and economic commitments, like building pyramids or by a man on the moon. They became the crucibles of innovation creating challenge to innovations and integrating technologies, people, systems, organizations and methods;
- The second kind is the incremental innovation. The process of technology development at the operations level is driven by competitive forces. They lead to the improved products and services. The number of patent applications each year in the world, largely emanating out of these efforts, is estimated to be well over one million;
- The third type of innovation arises through major breakthroughs. They give rise to altogether new industries. Telephones, x-rays, photography, xerox, jet engines and stereo sound are some examples of radical innovations.

True innovation comes from those who are motivated to break the status quo. Innovations not only break the mould, they also yield far better returns than ordinary business ventures. One American study found that the overall rate of return for some 17 successful innovations made in the 1970s averaged 56%, compared with a 16% average return on investment for all American businesses over the past 30 years.

We need to create conditions which will nurture leaders who are visionaries and thinkers, who believe in discontinuities, who are capable of thinking of the impossible and inspiring people to make it happen. It is been recognised that the enabling environment to induce, encourage and sustain innovation need to be created increasingly in small and medium operations.

The power of innovation, especially in the information technologies, is apparent from the fact that today, America gets more than half its economic growth from industries that barely existed a decade ago.

Influence of the Internet and the New Information TechnologiesThe Web for Business

A growing number of SMEs are leveraging their advantages with the enabling power of the Web. It is not that they are rushing into it because E-commerce ventures are where the opportunities are. They are systematically extending their corporations from 'Brickworld' to 'Clickdomain.'

The Internet is helping companies to lower costs dramatically across their supply and demand chains, to enter new markets, to create additional revenue streams and to redefine their business relationships. Entirely new companies and business models are emerging to take advantage of new possibilities.

In laying the foundation of this extension, there are three important factors to consider:

- First, it is necessary to understand the nature of the Internet. It is, essentially, to disseminate information to target specific audiences, and to generate direct responses;
- Second, while laying the foundation of the Internet and a corporate Intranet one must understand the competitors' presence on the web;
- Third, the web provides an opportunity to experiment and learn at the same time. The success of the Web lies in its ability in adapting to improvise a new business plan by finding out in real-time ideas that are commercially viable and those that are not. It helps create a virtual marketplace.

The "New Business Ecosystem", as it is called, arises out of new and symbiotic relationships between companies which provide mutual business. 'Co-opetition' is the emerging strategy where suppliers offer complimentary services in specific instances, even though they otherwise become competitors.

The Web for business means taking a hard look at your customers, your operations, your suppliers, indeed your partners and reorganising yourself. It is about getting to your core competencies and providing products and services through new channels. For many companies this may well be the greatest opportunity to excel.

In the words of Larry Carter, Chief Officer of Cisco Systems, a company that sells about 80% of the routers and other forms of networking equipment that power the Internet, *"It's no longer about the big beating the small - It's about the fast beating the slow."*

E-commerce

Trade between businesses makes up more than 70% of the regular economy. Business to Business (B2B), E-commerce dwarfs Business to Consumers (B2C) variety.

B2BE-commerce cuts companies' costs in three ways.

- First, it reduces procurement costs, making it easier to find the cheapest supplier and cutting the cost of processing transactions;
- Second, it allows a better supply chain management;
- Third, it makes possible tighter inventory control, so that firms can reduce their stocks or even eliminate them.

The Web marketplace falls into three broad categories:

- Online Catalogues: they simply gather catalogues of all the suppliers in a given industry and put the resulting 'Meta-catalogue' online;
- Auctions: offer a mechanism to negotiate prices. They are in the form of conventional set-up to help the seller to get the best price. More often, they are 'reverse auction' where suppliers compete by bidding lower prices;
- Exchanges: offer constant price adjustments as supply and demand rise and fall.

Tapping into the flow of information and commerce between companies will be a real competitive advantage for SMEs. Large companies who cannot manufacture or provide services all on their own, are driving a hard bargain. They are also setting up their own procurement hubs or direct website sales rather than through independent exchanges.

Communications & Multimedia

Only in the past two decades or so have we had three great innovations - the fax, the mobile telephone and the Internet - that have shown how the network can be used to create new mass market products that change the way people live and work. Communications are at the center of the most intense innovation industry ever seen. Its closest analogy is of the many ways the electrical power shaped the 20th century.

The fusion of developments in telecommunications, computers and software are providing new possibilities to SMEs to access markets and opportunities, which were not possible earlier. It is reducing trade barriers and creating a new infrastructure.

A key benefit of the Web is that it offers low-cost access to many sources of information and many types of data - text, audio, video and graphics. Data types and relationships are beyond the technical capabilities of relational databases. Animation and virtual reality are emerging tools to further sharpen the competitive edge of enterprises.

Wireless Applications Protocol (WAP) enabled cellular phones linked to palms, which are providing points of sales inventory management systems and greatly reducing cycle times and labour costs.

3G (3rd Generation) networks are scheduled to go live in 2002. Hopefully, they will be switched on for the world cup. The new devices on sale are likely to be called not phone but communicators.

Rapid Prototyping

Those who reach markets with their product first, enjoy great advantages in terms of leadership, market share, and consumer loyalty. Increasing global competition is forcing manufacturers to create better products in less time and, at the same time, ensuring a tight control over the costs at each stage of product development - from concept, to designing, tooling, and actual production.

The technology which guides the product from concept to market quickly and inexpensively, by comprehensively reducing the product development cycle is rapid prototyping (RPT). It creates a physical object (prototype) directly from the computer model data.

The advances in information technology are thus going beyond the Internet and E-commerce. They are helping us through developments in rapid prototyping and flexible manufacturing to gain competitive advantages at the level and size of operations, which are suited to SMEs.

Impact on Small and Medium Enterprises (SMEs)

The advantages of cost and of generating innovative ideas have given rise to an increasing number of small and medium enterprises. Outsourcing has increased leading to the reduction of large conglomerates. The SME sector in India contributes 35% of output in the manufacturing sector, employing 15 million people, second only to agriculture and over 40% of total exports, making it one of the most vibrant sectors of the economy.

The history of the Silicon Valley is full of stories of SMEs being the driving force of growth and innovation. The German economic miracle after World War II is largely the result of the enormous success of its SMEs. In India, about 60% of companies registered with software technologies are SMEs.

The progression of many large companies up the value chain is creating in its wake, an increasing number of SMEs. For the first time SMEs developing products are more cost effective. Sharply reducing communication costs are rendering distances irrelevant, opening up opportunities for SMEs to offer cost-effective solutions all over the globe.

Conclusion

The Internet offers a new information system, a new marketplace, a new form of communication and a new means of distribution. The power of digital distribution has the power of leading to development of wholly new products and services that nobody has imagined, offering the hope of further increases in economic growth.

The Internet and new information technology are influencing the work of inventors and innovative SMEs in ways that are as far-reaching as earlier industrial revolution. An increasingly networked world is not just changing the way people work with each other. It is also giving rise to new opportunities. The new technologies, driven by innovation, make an unprecedented degree of collaboration possible, rapidly giving rise to new business alliances and federations.

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