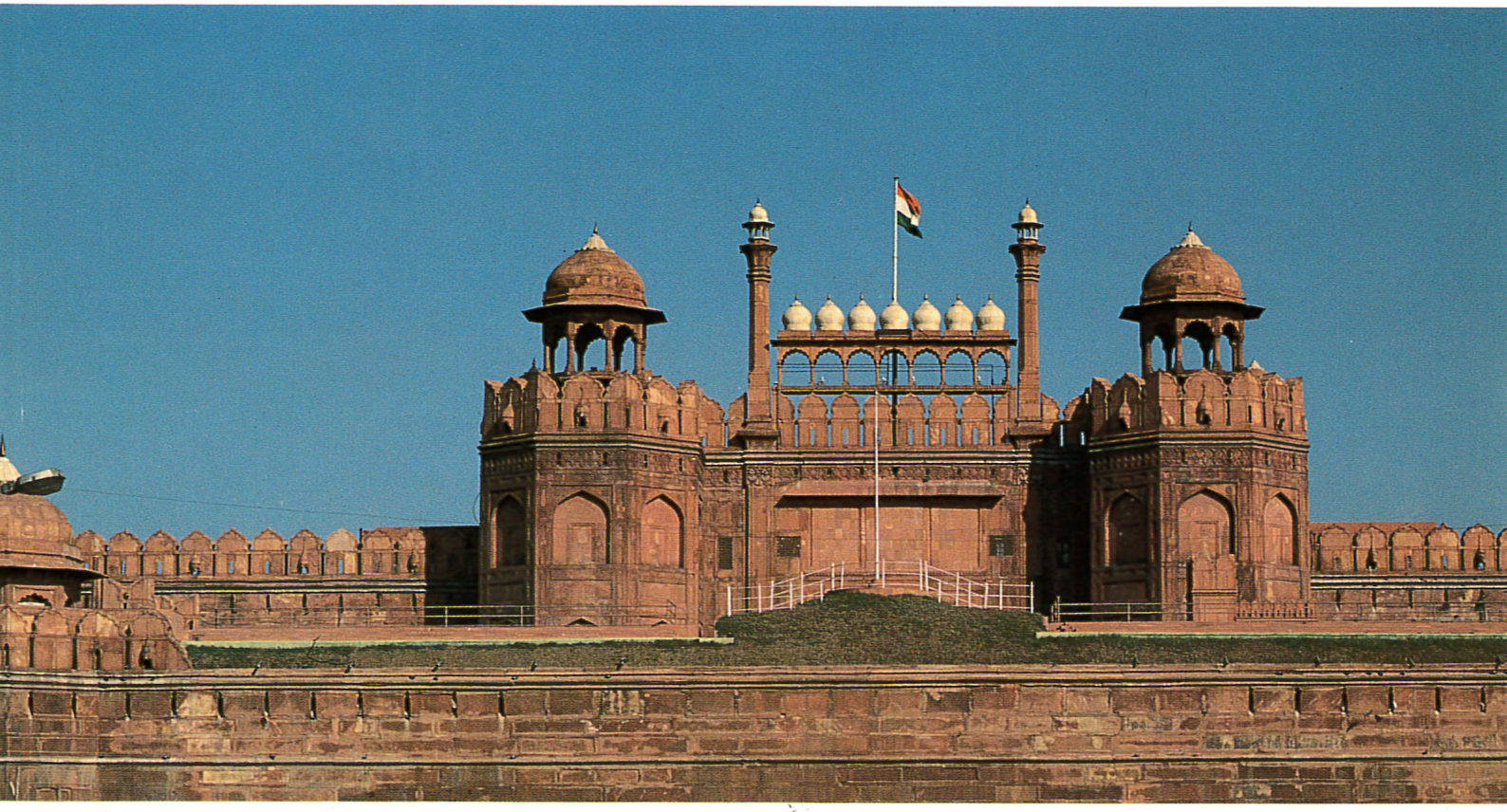
WORLD INTELLECTUAL PROPERTY ORGANIZATION



WIPO ASIAN REGIONAL SYMPOSIUM ON THE PROMOTION OF INVENTION AND INNOVATION

New Delhi, India 1992

GOVERNMENT OF INDIA

WORLD INTELLECTUAL PROPERTY ORGANIZATION

JAPANESE PATENT OFFICE

FICCI

WIPO ASIAN REGIONAL SYMPOSIUM ON THE PROMOTION OF INVENTION AND INNOVATION

organized by
the World Intellectual Property Organization (WIPO)
in cooperation with
the Department of Industrial Development,
Ministry of Industry, Government of India
and the
Federation of Indian Chambers of Commerce and Industry (FICCI)
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the Japanese Patent Office (JPO)

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PREFACE

The present volume contains the texts of addresses and papers presented at the WIPO Asian Regional Symposium on the Promotion of Invention and Innovation, which was held in New Delhi, India, from February 5 to 7, 1992.

The Symposium was organized by the World Intellectual Property Organization (WIPO) in cooperation with the Government of India and the Federation of Indian Chambers of Commerce and Industry (FICCI) and with the assistance of the Japanese Patent Office (JPO).

The Symposium was financed out of a trust fund established by WIPO following a contribution of the Government of Japan to the Development Cooperation Program of WIPO. Activities under the trust fund concern developing countries in the Asian and Pacific region, particularly those whose economic and technological growth requires an effective framework for the management of national intellectual property resources, including results of inventive and innovative activities.

The deliberations at the Symposium covered various aspects of the promotion of invention and innovation, including the role of the industrial property offices and of research and development institutions in the promotion of inventive and innovative activity; the encouragement of inventiveness in enterprises; development and commercialization of inventions and the role of entrepreneurs; patent documentation as a source of technological information; and university-industry links.

The Symposium was attended by over 80 participants from Government institutions and the private sector in Bangladesh, China, India, Indonesia, Iran (Islamic Republic of), Malaysia, Mongolia, Nepal, the Philippines, the Republic of Korea, Singapore, Sri Lanka, Thailand and Viet Nam; and included 12 experts and speakers from Australia, Germany, Hungary, India, Japan, the Republic of Korea, the United States of America and from WIPO, as well as representatives of FICCI, JPO and WIPO.

I take this opportunity to renew WIPO's thanks to the Government of Japan and, in particular, to the Japanese Patent Office, for their generous assistance in the organization of this Symposium, and to the Government of India and the Federation of Indian Chambers of Commerce and Industry for their excellent organizational support and for the warm welcome and hospitality extended to all the participants in the Symposium.

Arpad Bogsch
Director General
World Intellectual Property Organization

Geneva, July 1992

TABLE OF CONTENTS

PROGRAM

prepared by the International Bureau of WIPO

Wednesday, February 5, 1992

Morning

9.00 a.m.	Registration of the participants	
9.30 a.m.	Opening of the Symposium	
	Addresses by:	Dr. Bansi Dhar, Chairman, Technology Committee, Federation of Indian Chambers of Commerce and Industry, New Delhi, India
		Mr. Wataru Fukasawa, Commissioner, Japanese Patent Office, Tokyo, Japan
		Mr. Shahid Alikhan, Deputy Director General, World Intellectual Property Organization, Geneva
		Professor P.J. Kurien, Minister of State for Industry, Government of India, New Delhi, India
10.15 a.m.	Coffee break	
TOPIC 1:	THE INDUSTRIAL PROPERTY SYSTEM AND THE PROMOTION OF INVENTIVE ACTIVITY: ROLE OF THE INDUSTRIAL PROPERTY OFFICE	
10.45 a.m.	Speaker: 1.	Mr. Wataru Fukasawa, Commissioner, Japanese Patent Office, Tokyo, Japan
11.45 a.m.	Speaker: 2.	Mr. Patrick Smith, Commissioner, Australian Patent, Trade Marks and Designs Offices, Canberra, Australia
12.45 p.m.	Discussion	
1.00 p.m.	Lunch break	

February 5, 1992 (continued)

Afternoon

TOPIC 2:	THE ENCOURAGEMENT OF INVENTIVENESS IN ENTERPRISES	
2.30 p.m.	Speaker: 1.	Dr. Gurpreet Singh, Chairman and Managing Director, Continental Device India Ltd., New Delhi, India
3.30 p.m.	Coffee break	
4.00 p.m.	Speaker: 2.	Mr. Arno Körber, Executive Director and Head, Patent Department, Siemens AG, Munich, Germany
5.00 p.m.	Discussion	

Thursday, February 6, 1992

Morning

TOPIC 3:	THE ROLE OF RESEARCH AND DEVELOPMENT INSTITUTIONS IN THE PROMOTION OF INVENTIVE AND INNOVATIVE ACTIVITY	
9.00 a.m.	Speaker: 1.	Ms. Harumi Takahashi, Director for Planning of Basic Technology for Future Industries, Agency of Industrial Science and Technology, Ministry of International Trade and Industry, Tokyo, Japan
	Speaker: 2.	Mr. Tae-Chang Choi, Director General (without portfolio), Korean Industrial Property Office, Seoul, Republic of Korea
10.30 a.m.	Coffee break	

February 6, 1992 (continued)

10.45 a.m.	Speaker: 3.	Professor Gábor Kovács, Director, Institute for Drug Research, Budapest, Hungary
11.30 a.m.	Discussion	
TOPIC 4:	UNIVERSITY-INDUSTRY LINKS; LICENSING; TECHNOLOGY TRANSFER ARRANGEMENTS; RESEARCH AND DEVELOPMENT	
11.45 a.m.	Speaker:	Mrs. Katharine Ku, Director, Office of Technology Licensing, Stanford University, California, United States of America
12.45 p.m.	Discussion	
1.00 p.m.	Lunch	

Afternoon

TOPIC 5:	DEVELOPMENT AND COMMERCIALIZATION OF INVENTIONS (FINANCING, VENTURE CAPITAL, PATENTING, AND THE ROLE OF "ENTREPRENEURS")	
2.30 p.m.	Speaker: 1.	Mr. S.P. Banerjee, Executive Director, Industrial Finance Corporation of India, New Delhi, India
3.30 p.m.	Coffee break	
3.45 p.m.	Speaker: 2.	Mr. Vladimir Yossifov, Senior Program Officer, Patents and Promotion of Innovation Section, Industrial Property Division, WIPO, Geneva
4.45 p.m.	Discussion	

Friday, February 7, 1992

Morning

TOPIC 6:	THE TECHNOLOGICAL INNOVATION PROCESS; PATENT DOCUMENTATION AS A SOURCE OF TECHNOLOGICAL INFORMATION	
9.30 a.m.	Speaker: 1.	Mr. Masatoshi Nishikawa, Deputy Director, Patent Information Management Division, Japanese Patent Office, Tokyo, Japan
10.30 a.m.	Coffee break	
10.45 a.m.	Speaker: 2.	Mr. Ronald E. Myrick, Assistant General Counsel, Digital Equipment Corporation, Maynard, Massachusetts, United States of America
11.45 a.m.	Panel Discussion	
	Chairman:	Mr. N.R. Krishnan, Acting Secretary, Department of Industrial Development, Ministry of Industry, New Delhi, India
12.45 p.m.	Closing Ceremony	

ADDRESS

by

Dr. Bansi Dhar
Chairman, Technology Committee
Federation of Indian Chambers of
Commerce and Industry
New Delhi, India

Honorable Professor Kurien,
Mr. Fukasawa,
Mr. Uemura,
Mr. Shahid Alikhan,
Mr. Krishnan,
Distinguished Participants,

On behalf of the Federation of Indian Chambers of Commerce and Industry (FICCI) and myself, I extend a hearty welcome to you all, and particularly to participants from other countries of the region. We are grateful to Professor Kurien for having kindly agreed to inaugurate the Symposium and are honored to have him with us. I also thank WIPO for associating FICCI in organizing this Symposium.

In the course of the three-day deliberations, we shall have the benefit of many presentations followed by discussions on the subject of "Promotion of Invention and Innovation." This subject assumes great significance in the current global environment. For, development of a nation today depends on its ability to adapt for its own purposes the continuously changing technological environment. Technological advancement can only be brought about through research and its application, which manifests itself in discoveries, inventions and innovations. It is through new technologies that emanate from such efforts that new products and facilities are created. They also help better utilization of natural resources, leading to higher productivity, improved quality and lower costs in terms of consumption of resources and otherwise.

Research and development has thus become the engine of progress for improving the quality of life on our planet. And the researcher comes to occupy a preeminent position in the global scheme of things. He deserves to be provided all inputs that will allow him to maximize the contribution from his efforts. He has also to be allowed to benefit from his efforts so that he will have the incentive to devote his creative abilities for further development for the good of society.

Societies involved with scientific development have devoted much thought and attention to establishing equities between the creator and those whom the creation ought to serve--if he has to have any claim to recognition and respect. And also to ensure that recognition and reward of creativity are so designed that they spawn further innovative development rather than hinder it

or block the way for other creative effort. This has involved continuous fine tuning of diverse interests and the process indeed goes on as new perceptions develop of what constitutes productive balancing of interests. The nomenclature "Intellectual Property Rights" is very apt in the situation and the ongoing international debate on its redefinition and redelineation is a part of the same noble exercise.

Providing protection to intellectual property rights has to be a highly sophisticated exercise. Considerations of individual--and corporate--motivation have to be weighed against the claims of the community. Patents and other instruments of protection of intellectual property indeed serve two purposes: One, to encourage creativity and subsequent innovative work to put it to practical use, by providing fair compensation to the creator. Second, to procure information about the creative work for the community at large. Both these aspects--that of incentive, and of disclosure--are equally important.

This duality is specially significant for developing countries like ours. We have need for access to available technologies as well as for self-sufficiency and independent national initiative. Private rights have therefore to be balanced against public-interest objectives, and norms and standards of protection have to be attuned to the stage of the country's development.

This is indeed the position in developed countries too--historically as well as contemporaneously. All societies modulated the application of patent and other protectionist laws when going through the development process. Even advanced countries modulate them, for example, in pursuance of their antitrust aims. Such flexibility is an inherent requirement of public policy, without which the process of national development would be set back. It goes without saying that flexibility has to be exercised in such a manner that motivation to share technology does not suffer.

Over the years, India has developed a strong scientific and technological base covering a wide spectrum of disciplines. Our R & D efforts have been directed towards updating technology and effecting improvements in the manufacturing processes as well as developing new products and processes. Policy measures have been initiated to meet the changing requirements of the country. Last year, our Government introduced several policy reforms relating to industry, trade and foreign investment. These changes are aimed at reducing bureaucratic intervention and enhancing the integration of Indian economy in the world ethos. The new industrial policy has identified several objectives and measures for the promotion of technology development within the country as well as facilitating inflow of state-of-the-art technologies from abroad.

Presently, there are in India over 250 national research institutions, 400 private-funded scientific research institutions, and 1200 in-house R & D units. The national expenditure on research and development and related science and technology activities is over Rs. 44 billion ($ 1.8 billion) annually. Our national laboratories are known for technical excellence in areas like superconductivity, material science, catalyses, composite materials, plant varieties, etc. The industrial groups accounting for major share of the R & D expenditure include chemicals and allied industries,

pharmaceuticals, electrical and electronics industries, mechanical, processing and agro industries.

Other countries in the region also have their R & D programs and accomplishments. We must, therefore, work towards building a strong technological relationship among ourselves and share our experience and expertise in the area of R & D. Being in a developing state, we are, by definition, deficient in resources. Regional cooperation will help multiply the results of our efforts and increase the significance of our contribution to world knowledge.

Joint research programs will supplement purely national programs. Scientists of different countries should work together in each other's laboratories on projects of common interest, such as health, food, energy, housing, ecology, etc. Collaboration in research and development can be on a company-to-company basis as well as between public and government institutions.

In order to promote any form of cooperation, it is necessary that there be regular flow of information about each other's capabilities and facilities. There should therefore be exchange of scientific information, materials and designs, and of ideas. This will provide an opportunity for understanding each other's problems and lead to emergence of solutions and new ideas.

There is also need for a financial mechanism for joint research projects, for determining allocation of funds according to agreed priorities. Whether we share each other's experiences or promote joint R & D projects, the aim ought to be to optimize utilization of each country's available resources and manpower, to avoid repetitive research, and to work towards developing new technologies.

Governmental action will be needed to facilitate collaborative R & D efforts, through policies which provide easy access to and use of resources, freedom to decide upon direction of research, and adequate incentives for creativity. Financial institutions will find it worthwhile to support such research activities by providing funds for laboratory research as well as for commercialization of its results.

In concluding, I would only like to reiterate the need for fostering cooperation in the field of research and development, which forms the basis for creating new technologies. Closer cooperation and interaction between research institutions, universities and industry of our countries will facilitate more rapid exploitation of the results of research and their application for societal use. These efforts must be facilitated by governmental policies conducive to the atmosphere for research. Ultimately, the aim of promoting basic and applied research would translate into increased levels of national productivity, enhanced transactional opportunities, and global competitiveness.

Thank you.

ADDRESS

by

Mr. Wataru Fukasawa
Commissioner
Japanese Patent Office
Tokyo, Japan

Ladies and Gentlemen,

I feel very honored to have this opportunity of presenting my opening address on the occasion of this commemorative Symposium attended by Your Excellency, the Minister of State for Industry, representative members of the Federation of Indian Chambers of Commerce and Industry (FICCI), heads of the patent offices in Asian countries and Australia, the Deputy Director General, Mr. Shahid Alikhan, of WIPO, and the many honored guests.

This season in India is the most wonderful one of the year, and the streets are filled with flowers of flame trees and bougainvilleas. Our visit to India from abroad has been most heartily welcomed, giving us great pleasure. This city of New Delhi is most impressive, both as the seat of the principal governmental organizations and the center of politics in India and with its streets lined with neat rows of stores and houses.

Even more impressive has been the warmhearted hospitality extended by the governmental authorities of India and the members of FICCI, who have exerted their efforts in hosting this Symposium and for its excellent overall organization. I wish to take this opportunity to express my deepest appreciation to all the personnel concerned.

In observing the situation concerning the present status of industrial property, the active process of development of economic globalization has also resulted in the movement of industrial property across the borders of commodities and technologies. As a consequence, the importance of the industrial property system has been very much enhanced.

Thus, in the present situation, attempts to achieve as much harmonization of the patent system as possible, which of course differs from country to country, have moved the negotiations in WIPO for patent harmonization to a very interesting stage.

Obviously, to aim for the smooth future development of the world economy and industrial technology, it is necessary to achieve harmonization of industrial property systems and their operation in cooperation with each country, in the recognition that it is indispensable to develop a common foundation for the industrial property system for the 21st century. Clearly, the most urgent task before us now is to fruition WIPO's patent harmonization efforts, and the reopening of the brisk discussions on those negotiations is much looked forward to.

At such a time as this, then, we are confident that it is very meaningful that representatives of governments, representatives of industry and of the academic world, and the personnel concerned with patents in the principal countries in the Asia-Pacific region--this region where very remarkable economic growth and a dynamic transformation have been occurring in recent years--are now joining here together to exchange their views face-to-face on how to improve the patent system.

The economic situations differ from one country to another in Asia, and the current situation of the industrial property system in these various countries is also at different stages, depending on the individual country involved. In addition, patent offices in each country face difficult problems requiring their respective solutions.

In order to solve such pending problems in the various countries, and to achieve harmonization in the operation of the industrial property system, it will prove efficient for each country to initially gain sufficient knowledge relating to the role of research and development institutes in the promotion of its industrial property system and the encouragement of inventiveness by enterprises, together with the promotion of inventive and creative activities.

This should then be followed by an examination of pending problems and experiences gained.

Fortunately, Japan has 100 years of history relating to its industrial property system. Also, Article 1 of the Japanese Patent Law stipulates the objectives of the patent system. This Law is intended for the protection and utilization of inventions, thereby encouraging inventiveness and consequently contributing to industrial development. The theme of this Symposium expresses one of the objectives of such a patent system. With such a system, of course, Japan has experienced many stages in both the system aspect and operation as well as many other problems. We sincerely hope that our experience can be useful to the participating countries in improving their own industrial property systems.

I will be most pleased if this meeting is interesting and rewarding for all of us, as in last year.

Thank you for your attention.

ADDRESS

by

Mr. Shahid Alikhan
Deputy Director General
World Intellectual Property Organization

Your Excellency,
Mr. Minister of State for Industry,
Dr. Bansi Dhar,
Chairman, Technology Committee of the Federation of Indian Chambers of Commerce and Industry,
Mr. Wataru Fukasawa,
Commissioner of the Japanese Patent Office,
Mr. N.R. Krishnan,
Acting Secretary, Department of Industrial Development, Ministry of Industry,
Mr. D.H. Pai Panandiker, Secretary General, FICCI,
Mr. David Jenkins, Deputy Representative of UNDP,
Mr. Shozo Uemura, Director, International Affairs Division of the Japanese Patent Office,
Distinguished Guests, Speakers and Participants,
Ladies and Gentlemen,

It is an honor and a pleasure for me to be amongst this distinguished gathering and to welcome you all, most cordially, on behalf of the World Intellectual Property Organization (WIPO) to this WIPO Asian Regional Symposium on the Promotion of Invention and Innovation. Dr. Arpad Bogsch, Director General of WIPO, has asked me to convey to all of you his warm greetings.

The presence at this inaugural ceremony of the Honorable Minister of State for Industry and other distinguished guests is a great honor for the organizers and the participants and I would like, on behalf of WIPO, to express our deep gratitude and appreciation for their presence here today.

I wish to convey our gratitude, through you Sir, to the Government of India, for kindly agreeing to host this Asian Regional Symposium. Our special thanks and gratitude are due to the management and all the officials concerned of the Federation of Indian Chambers of Commerce and Industry (FICCI) who are the local organizers, and in particular, to Mr. D.H. Pai Panandiker, Secretary General, and Mrs. Promilla Madan, Deputy Secretary, for the excellent facilities they have provided for the successful conduct of the Symposium. I would like to warmly thank Dr. Bansi Dhar for his interesting opening address and request him to please convey our greetings and thanks also to Dr. V.L. Dutt, President of FICCI, who is not here today.

I should like to express WIPO's gratitude to the Government of Japan for their generous contribution towards the development cooperation program of WIPO in the Asia and Pacific region. This meeting is being funded from such contribution. I should like to convey WIPO's grateful thanks to the Commissioner of the Japanese Patent Office, Mr. Wataru Fukasawa, and his esteemed colleagues, for their assistance and for participating in this Symposium.

Modern international economic trends have shown that it is the continuous adoption of new ideas and innovative techniques in the process of economic change that leads to sustainable economic growth and improved social welfare.

There is increasing recognition among policymakers, administrators, the business community and development economists, of the important contribution that intellectual property can make to promotion of inventive and innovative activity, and thence to technological and economic growth. In an international economy oriented towards more knowledge-based patterns of economic growth, the promotion and protection of intellectual property holds the key to most productive investments, attraction of scarce foreign investment funds, creating seedbeds of indigenous technological capacities, and developing a dynamic international trading potential.

In the Asia and Pacific region, there is clearly a need to mobilize the intellectual property system, especially for improving international trade and technological advance. This should concentrate on three interlinked components:

- first, the generation of conditions and circumstances, policies and incentives for greater creativity, development of technology-based knowledge and through specific emphasis on the role of the education and vocational training systems and of research and development policies on innovation, invention and enterprise;

- second, the provision of facilities for transforming these ideas and knowledge into legally and economically secured forms of intellectual property (patents, trademarks, copyrights, industrial designs) which are more or less harmonized across countries of the region thereby facilitating economies of scale in technological development and in stimulating appropriate technology transfer;

- and third, the development of infrastructure which enables easy access to the increasing stock of technical, industrial and commercial knowledge by entrepreneurs, investors, inventors, so that commercialization of technologies and increased trade in new products and processes are generated.

The aim of the Symposium is to examine, on the basis of exchange of experience, the ways in which invention development and the commercialization of inventions may be supported and facilitated in the countries of the Asia and Pacific region by way of more effective government policies, better services of the industrial property offices and other concerned agencies of government, and by the efforts of R & D institutions and the private sector enterprises.

The World Intellectual Property Organization is the UN specialized agency that deals with the legal protection of inventions. It administers the Paris Convention for the Protection of Industrial Property. It is the Paris Convention that, for over 100 years now, has secured, on the international level, the recognition of the moral and material interests of inventors.

We are interested in the promotion of inventive activity and, as a means for such promotion, in the strengthening of the patent system all over the world, in each and every country. We are paying particular attention to the developing countries where the legal and administrative infrastructure protecting inventors needs to be established or strengthened where it exists. There are immense, untapped sources of inventive talent in the developing countries, and WIPO does its best--within its limited budget--to promote the cause of inventors and inventiveness in those countries. Better protection of inventors will not only serve the interests of the inventors of the developing countries but also the general economic interests of those countries.

It is WIPO's mandate to facilitate policies and incentive systems, circumstances and conditions, which are conducive to the generation of knowledge, their transformation into intellectual property, and their subsequent application in economic, commercial and social uses. As economic growth and development become increasingly technology-based, and with many new technologies emerging with every passing year, the centrality of intellectual property concerns to economic development is clearly evident.

The landscape of public administration is changing rapidly and intellectual property offices and related organizations will be at the frontiers of economic and technological development very soon in the Asia and Pacific region.

The participants in the Symposium will benefit by the knowledge and experience of the distinguished speakers whom I would like to introduce individually. They are Mr. Pat Smith from Australia, Mr. Arno Körber from Germany, Professor Gábor Kovács from Hungary, Dr. Gurpreet Singh and Mr. S.P. Banerjee from India, Mr. Wataru Fukasawa, Mrs. Harumi Takahashi and Mr. Masatoshi Nishikawa from Japan, Mr. Tae-Chang Choi from the Republic of Korea, Mrs. Katharine Ku and Mr. Ronald Myrick from the United States of America, as well as one of our colleagues, Mr. Vladimir Yossifov, from WIPO. We are grateful to the speakers who have spent time and effort in preparing their papers. I would like to thank each of them for having spared the time from their busy schedules to participate in this Symposium. I am sure that they will find this experience both interesting and rewarding.

The participants are from 14 countries in Asia, namely, Bangladesh, China, India, Indonesia, the Islamic Republic of Iran, Malaysia, Mongolia, Nepal, the Philippines, the Republic of Korea, Singapore, Sri Lanka, Thailand and Viet Nam. To all of them I bid a warm welcome. I hope they will find the deliberations informative and useful. In particular, I would encourage them to participate actively in the discussions that will follow each topic, and to feel free to ask the lecturers to clarify any points of doubt or on which they would wish to gather further information. This would help in awareness raising which is always an important adjunct in the process of human resource development.

I hope that during the proceedings of the Symposium there will be a fruitful exchange of views on the topics to be presented and issues related to the promotion of inventive and innovative activity nationally and regionally.

In concluding this address, I renew WIPO's thanks to the Government of India for hosting this Symposium, to the Government of Japan and the Japanese Patent Office for their financial and technical support, to the Federation of Indian Chambers of Commerce and Industry for the facilities they have so kindly provided to us, and to all the distinguished guests, speakers and participants for their presence with us today. I wish this Symposium every success.

ADDRESS

by

Professor P.J. Kurien
Minister of State for Industry
Government of India
New Delhi, India

Distinguished Participants,
Ladies and Gentlemen,

I am indeed very happy to be associated with this three-day WIPO Asian Regional Symposium on the Promotion of Invention and Innovation.

I welcome you all to India. You must be looking forward to a free exchange of views during these three days on how to further contribute to the technological and industrial development of this part of the globe. I hope the weather of Delhi at this time of the year and the efforts of the organizers have provided the right atmosphere for intellectual interaction amongst the participants and the guest faculty.

I need hardly emphasize that the need for promoting innovation and inventive activities in this part of the world is far greater than anywhere else as a vast majority of the poor of the world live here. Even though this region of the world is richly endowed with natural resources, yet their optimal exploitation for the benefit of the poor has so far not been possible. There are many reasons for this. Amongst these, the importance of innovation and inventive activities as a key mechanism for ensuring material progress for raising the standard of living of the poor has not been fully appreciated. Production and productivity in every sphere of human endeavor are as important as, if not more than, the redistributive policies and programs. If this simple fact is kept in view, then the significance of innovative and inventive activities becomes self-evident. The policies and programs of the government must assist in developing and fostering a climate suitable for such activities. These activities often require a considerable investment of man and material resources over a long period of time. And when this is done, then the need for protecting and promoting the interest of those who make such investment has to be balanced with the need for making the benefits available, quickly and at a reasonable cost, to all those desirous of using the results of the inventive activity.

Every innovative and inventive activity is, explicitly or impliedly, directed towards raising the standard of living of the beneficiaries by providing new and better solutions to technical problems. Therefore, society has a stake in all such developments. It would not like the inventions to remain unused or their benefits to be appropriated by a few producers and consumers. It would also not like the efforts at innovative activities to be duplicated. Understandably, the patent regime, on the one hand, provides a limited monopoly to the right holder and, on the other, provides for early publication of the details of the invention to enable spread of new ideas to

all those who care to know. However, while granting such exclusive rights to the right holders, we, in India, would like to ensure that firstly, the inventions are actually worked by taking up the production of the patented product in India or by use of the patented process in India, to the extent practicable, and secondly, that the patent rights do not become a means for merely enjoying importation monopolies. I do hope that you would keep basic objectives of our patent system in mind while discussing the ways and means for promoting innovative and inventive activities. I am aware that finding the balance between the optimum level of private rights in terms of patent protection and the rapid flow of benefits to society through diffusion and adaptation of patented technologies is a very challenging task, and more so, in a dynamic situation where the number of variables could be very large. Even so, the attempt to find feasible solutions would have to continue. In the overall interest of mankind the future of the poor of this planet must, however, never be lost sight of.

Before I conclude, I would like to express my sincere thanks to WIPO for organizing this Symposium in Delhi, to FICCI for providing all the necessary facilities, and to the Japanese Patent Office for providing the required financial support for this endeavor.

I wish the Symposium all success.

Thank you.

TOPIC 1

THE INDUSTRIAL PROPERTY SYSTEM AND THE PROMOTION OF INVENTIVE ACTIVITY: ROLE OF THE INDUSTRIAL PROPERTY OFFICE

by

Mr. Wataru Fukasawa
Commissioner
Japanese Patent Office
Tokyo, Japan

I. INTRODUCTION

1. Today I would like to speak on the role of the industrial property office in promoting inventive activity by explaining our activities in Japan.

The promotion of inventiveness and creative activities is extremely important for the development of industry.

To promote inventiveness and creative activities, endeavors by enterprises and measures encouraging inventiveness such as the support extended by research and development institutes, aid systems for research and development, tax incentives, and services providing financing, investment and technical information are necessary. In addition to them, it is also necessary to conduct the comprehensive and efficient operation of a patent system which is the foundation supporting these activities.

Since the latter part of the 19th century, Japan has concentrated its energies on the promotion of industry and achieved a great deal of its economic development.

The efficient promotion of the measures I mentioned earlier has been a substantially impelling force in the background of such development. And it is believed that, in particular, the smooth operation of the patent system has greatly contributed to it. Incidentally, this development has been reflected in the yearly number of patent and utility model applications in Japan. That is at present a total of 500,000 applications, a tremendous increase compared to only 425 patent applications in 1885, when the patent system was initially established.

2. The patent system protects the rights of the inventor and the system in itself functions as an infrastructure for encouraging inventions. At the same time, the technology is publicly disclosed under the system of publication of applications, which further stimulates the motivation of third parties toward inventiveness.

Former US President Abraham Lincoln was also an inventor. He once said "the patent system adds the fuel of interest to the fire of genius." This adroitly expresses how strongly patent systems stimulate the motivation of researchers and engineers toward inventiveness. These words were expressed coincidently on this date 133 years ago, that is, February 5, 1859, and today after a lapse of 133 years, the meaning of these words has not changed, and will remain the same for the future.

3. An industrial property office should obviously work to ensure the smooth operation of a patent system including prompt and precise granting of rights as well as legislative revision in line with the needs of the times. But, besides these, it is important for an industrial property office to contribute to the promotion of inventiveness through its own activities and those of related organizations. Let me elaborate on this point in more detail.

First, popularization of the patent system and public relations: In other words, the foundation of effective function and smooth operation of the patent system is to have widespread and thorough understanding of the contents and importance of the patent system among the public. Also, knowledge regarding the patent system is indispensable to engineers, research scholars as well as to executives of enterprises.

Next, the encouragement of inventiveness: The basic condition for creation of better inventions is to have as many persons as possible take an interest in, and realize their importance. Encouragement of inventiveness for the younger generation is also as important as for enterprises presently engaged in production activities. For this, it is vital to take measures which will nurture their creativity and enable them to experience the pleasure of realizing ideas.

Finally, dissemination of patent information: Patent information is a valuable property obtained as a result of human wisdom and industrial activity. Technical information is also the foundation of vital technological development. Patent information is also important legal information regarding patent rights which promotes technology transfer.

Up to this point, I have touched upon the relationship of the patent system with invention and creative activities in general as well as the role of the industrial property office involved. And now I wish to talk about practical cases in Japan.

II. ACTIVITIES IN JAPAN

In Japan, regarding the previously mentioned (1) popularization of and publicizing the patent system, (2) encouragement of inventiveness, and (3) dissemination of patent information, in view of their importance, the Japanese Patent Office (JPO) and its related organizations, the Japan Institute of Invention and Innovation (JIII) and the Japan Patent Information Organization (JAPIO) have been carrying out energetically various activities in close cooperation and contributing to the promotion of inventive activities of enterprises and inventors.

Thus,

(1) JPO mainly carries out popularization and public relations activities related to the patent system and activities for disseminating patent information.

(2) JIII implements activities to encourage inventiveness as well as to popularize and publicize the patent system.

(3) JAPIO disseminates patent information.

At the same time, there are additional organizations for promotion and encouragement of technology development in the government, the Agency of Industrial Science and Technology of the Ministry of International Trade and Industry (MITI) and the Science and Technology Agency. Also, other ministries and government offices are promoting their respective technological policies based on the industries under their jurisdiction.

Now I would like to turn to the specific activities of JPO, JIII and JAPIO.

III. ACTIVITIES OF THE JAPANESE PATENT OFFICE (JPO)

The activities of JPO in this regard can be divided mainly into popularization and public relations activities related to the patent system and dissemination of patent information.

1. Popularization of the Patent System

(1) Holding meetings to explain industrial property

In popularizing the patent system, first of all, JPO holds meetings to explain about industrial property. It is important to hold such sessions not only at the site of the main headquarters but also in local districts nationwide on a regular basis. In addition, the meetings must meet the different needs and levels of expertise of the participants. In Japan, JPO staff members are dispatched to local districts and two types of meetings are held.

(i) Holding "One-day Patent Office"
One type of meeting for providing instruction is called "One-day Patent Office" based on the concept of "opening" a JPO Office in the cities of local districts for one or two days. At this type of meeting, explanation about present patent administration and application filing procedures is given.
In FY (fiscal year) 1990, such meetings were held in four districts with a total of 400 participants.

(ii) Meetings on specific themes
The meetings on specific themes corresponding with needs are also being held nationwide.
For example, in FY 1990, they focused on the paperless program which JPO has been working on since 1984.
It is an attempt to computerize almost every aspect and stage of processing from the initial stage of filing applications to the final dissemination of patent information. In December 1990, an electronic application system as part of the paperless program was started, the first of its kind in the world. At the end of 1991, the percentage of application filings using the electronic application system such as on-line and FD was as high as 95%. Also, in FY 1991, meetings were held on the service mark registration system which is to be introduced in April of this year in response to the growth of the service sector in the Japanese economy. Already they were held in 52 major cities throughout the country with a total of more than 8,000 participants.

(2) Guidance and popularization for small and medium enterprises

Activities for small and medium enterprises are also important. In many large enterprises, industrial property departments are well organized and established. For example, more than 96% of the large enterprises have their personnel responsible for patents whereas in small and medium enterprises, it is difficult to establish offices related to industrial property because of the lack of qualified employees and other limitations. From this standpoint, in Japan, lectures and consultations adopted for small and medium enterprises have been implemented in local districts nationwide in cooperation with JIII.

(i) To deepen the understanding of the patent system, lectures are given on the system, patent management in enterprises, utilization of patent information and the like.

(ii) At consultations, advice on procedures for filing applications, searching prior art, etc. is given.

In FY 1990, such lectures were held 58 times, with a total of 4,000 attendants. Also, 8,000 participated in consultation meetings.

(3) Lectures by JPO staff members at universities

In addition to popularization activities directed at enterprises, researchers and engineers, enlightenment activities for individuals are also important, i.e., for students who are going to take their place in the industrial society. In Japan, 13 JPO staff members have been giving lectures to students at universities on such topics as the industrial property system, industrial property law and the like as part-time lecturers.

(4) Visits to JPO by enterprise employees

Our aim at JPO is to always be an open office, easily accessible from the outside. For this reason, employees of enterprises frequently visit JPO, deepening their understanding of the patent system in this way. In 1991, more than 1,300 persons visited JPO.

2. Public Relations Activities With Respect to the Patent System

Regarding public relations activities, I wish to explain about the publication of PR journals, Invention Day, and the utilization of mass media.

(1) Publication of the journal "TOKKYO" (PATENT)

Utilizing journals has proven effective in furthering and promoting better mutual understanding among persons concerned with patents. In Japan, JPO has been publishing a monthly journal with a circulation of 7,000 copies. Its contents cover a wide variety of subjects, from details of revised laws and international conferences (such as those organized by the World Intellectual Property Organization) to statistics regarding the number of applications. While it is a small publication, it is widely read by patent attorneys, business personnel concerned with patents, as well as JPO staff members, and it fulfills a major role in facilitating mutual understanding

among patent people. Meanwhile, as far as periodical journals are concerned, in addition to JPO, JIII, JAPIO and other organizations also publish them. There are a total of 12 journals available.

(2) Invention Day (April 18)

In Japan, April 18 is Invention Day. The very first patent law in Japan, the "Monopoly Patent Ordinance" was promulgated on April 18, 1885, and so in commemoration April 18 has been designated as Invention Day. Every year on this date, in order to promote more widespread understanding of the significance of the patent system, public relations activities such as lectures, Invention Day ceremonies and others are carried out.

I wish to cite one example. Please look at the poster you have at hand. This is the poster for "Invention Day" for April 18, 1991. This poster was drawn up based on an artwork by a child that was awarded the JPO Commissioner's prize in the "Art Exhibition on Dreams of Tomorrow's Science" sponsored by JIII. Its title is "Compact Bicycle Parking Machine." That is, when a bicycle is inserted into the blue machine in the picture, a compacted bicycle comes out. And, when a bicycle is compacted, it takes up less space for parking. It is an expression of a child's dream that fits with the reality in Japan where there is not much land space available even though many people use bicycles.

(3) Newspaper and TV public relations activities

Public relations activities through newspapers and TV have proven effective. That is, those participating in meetings and consultations are only those persons and enterprises interested in industrial property. However, newspapers and TV penetrate into family living rooms and serve as effective public relations for the general public. Particularly since the field of industrial property is a very specific field, it is difficult for the general public to understand. From this standpoint, public relations through newspapers and TV are effective to reach the general public.

In 1991, there were more than 500 examples of information published in nationwide newspapers relating to industrial property and nine TV broadcasts.

3. Dissemination of Patent Information

In line with the advancement and diversification of technologies in recent years, the need for patent information has been progressing and diversifying, and it is important to establish a system furnishing users with nationwide access to necessary information, promptly and accurately.

In Japan, the Japanese patent gazette, utility model gazette, publication of unexamined patent applications and publication of unexamined utility model applications are accessible at 97 locations throughout the country. In addition, patent gazettes of various foreign countries are also available. There was a total of 170,000 users in 1990.

Also, on-line access to a comprehensive database comprised of Japanese patent gazettes and those of major foreign countries such as the United States

of America, Germany, the United Kingdom and EPO (European Patent Office) is offered through the seven regional bureaus of the Ministry of International Trade and Industry throughout the country.

In addition to the services offered in these local districts, domestic and foreign patent gazettes and on-line services accessing, this comprehensive database is offered at the public library in JPO. Information on 31 million cases will be stored in this comprehensive database by the end of this March; on a monthly basis it is used 200,000 times.

Meanwhile, beginning from January 1993, an electronic gazette will be published in the form of CD-ROM. It is expected from this that patent information data will rapidly become more efficiently available and that it will be utilized for research and development in various forms. It is believed that this will result in further technological development.

Regarding access to patent information data by enterprises, JAPIO is also offering on-line services and so forth. I will later explain about the activities of JAPIO.

IV. ACTIVITIES OF THE JAPAN INSTITUTE OF INVENTION AND INNOVATION (JIII)

Next, I would like to explain the activities of JIII.

JIII's purpose is to encourage inventions and popularize industrial property. It was first established in 1904 and renamed JIII in 1947.

JIII, the only organization encouraging inventions in Japan, carries out various activities in cooperation with JPO. It is a nationwide organization with 441 staff members and an annual budget of about 20 billion yen. It has 47 branch offices throughout the country.

Principal Activities

JIII activities can be broadly divided into two, namely, activities to encourage inventiveness and training courses. Thus JIII plays a vital role in encouraging inventions and popularizing industrial property.

(1) Activities to encourage inventiveness

There are the following activities to encourage inventiveness.

(i) National Invention and Idea Contest (started in 1960)
Ever since 1960, a nationwide contest for inventions and creative thinking has been conducted every year. This contest aims at introducing to the world superior inventions, devices and designs that have not yet been marketed, and it is directed at putting these into practice. Items range from articles for daily use to industrial technologies. Ideas are invited and collected from all over the country and the winning contestants are awarded prizes and their prototypes and models are placed on exhibit.

(ii) Commendations (National Commendation for Inventions and Local Commendation for Inventions)
JIII conducts a "National Commendation for Inventions," selecting those individuals who have produced particularly excellent and creative inventions and those who have rendered remarkable service in the area of guidance and encouraging inventions.

JIII also conducts a "Local Commendation for Inventions," honoring those persons whose inventions have helped local industries and rendered remarkable service in implementing inventions in local industries.

Further, as I said at the outset, encouraging inventions with young people who will become the leaders of the next generation is also important, as well as with enterprises engaged in current production activities. JIII also implements encouragement activities for both boys and girls.

(iii) Exhibitions: All-Japan Exhibition of School Students' and Children's Inventions and Ideas (started in 1941); and All-Japan Exhibition of Teachers' and Educators' Inventions (started in 1951)
The All-Japan Exhibition of School Students' and Children's Inventions and Ideas has been carried out every year since 1941. It is intended for primary school pupils from six to 12 and junior high school students from 13 to 15 years of age, in order to arouse their interest in invention through experiencing the enjoyment of creation, thereby fostering their creative faculties. The creative works by pupils and students are invited and collected from all over the nation. The winning contestants are commended and their inventions are displayed at the exhibition.

The All-Japan Exhibition of Teachers' and Educators' Inventions which is intended for teachers of primary and junior high schools has been held since 1951. Here works that have been helpful in the education of pupils and students have been collected.

(iv) Invention clubs for boys and girls (presently 115 clubs nationwide)
JIII has also organized invention clubs for boys and girls in order to provide a place for school children to think, invent and create through experiments and handicraft.

The objective of these clubs is to promote children's interests and enhance their imagination through creative activities, thereby learning scientific ways of thinking and experiencing a science-oriented life. There are at present 115 clubs throughout the country. Each club focuses on electric experiments, handicraft and visiting factories.

(v) Exhibition of Children's Art on Dreams of Tomorrow's Science (started in 1979)
As noted earlier, this Exhibition of Children's Art on Dreams of Tomorrow's Science has been held every year since 1979. The aim of

this art exhibit is to have children freely express in artwork their dreams for the future, under the theme of "Dreams of Tomorrow's Science," while at the same time to arouse their interest in science.

(2) Training courses for disseminating information on the industrial property system

Training courses provided by JIII for disseminating information on the industrial property system are explained next. Regarding training activities, there are three courses: regular, extension and basic.

(i) Regular course
The regular course aims at cultivating those having a basic knowledge of industrial property.
This is a six-month course, and a variety of subjects based on a comprehensive curriculum are taught, relating to laws and treaties on industrial property, industrial property systems in foreign countries, patent management practices, application procedures, and litigation.
Lectures are given by university professors, attorneys-at-law, patent attorneys and specialists in private business and government offices.

(ii) Extension course
The extention course is held from time to time on industrial property subjects of current interest to society.
For example, in FY 1991, the following themes were presented: "Industrial Property Seminar for Engineers," "Examination Standards," "Practices in the Preparation of Specifications," "Patent Infringement Litigation and Technical Scope," "Protection of Trademark," "Intermediate Procedure as a Strategy."

(iii) Basic course
The basic course is for beginners and is aimed at teaching the concepts of the industrial property system and how to utilize it.
This course is based on various themes, with the following in FY 1991: "Basic Patent Course for Beginners," "Management of Patent Information for Beginners," "Filing Application Course on Industrial Property for Beginners--Measures for Electronic Application Filing."

V. ACTIVITIES OF THE JAPAN PATENT INFORMATION ORGANIZATION (JAPIO)

Lastly, I would like to explain the activities of JAPIO.

It was first established in 1971 and renamed to the present JAPIO in 1985.

JAPIO is an organization with about 300 staff members and an annual budget of about 20 billion yen. It has been playing an important role in disseminating patent information in Japan and has been greatly contributing to the promotion of technological development in enterprises.

Principal Patent Information Disseminating Activities

The patent information disseminating activities of JAPIO can be divided mainly into (1) services of furnishing patent literature, and (2) on-line patent information retrieval service.

(1) Services of furnishing patent literature

Firstly, JAPIO is offering the service of furnishing gazettes issued by JPO on patent, utility model, design and trademarks.

Moreover, JAPIO provides the service of furnishing foreign patent gazettes of the United States of America, the United Kingdom, Germany and EPO.

(2) Online patent information retrieval service

The on-line patent information retrieval service of JAPIO is called PATOLIS, that is Patent Online Information System, and there are 5,014 on-line terminals available at present in the enterprises which are used for prior art search. The following services can be utilized:

(i) Retrieval service which uses classification, keyword, name of applicant and the like for retrieval.

(ii) Reference service which finds and provides the corresponding portion of the gazette to the application or registration number.

(iii) Patent family search service which retrieves foreign applications having the same origin of invention.

VI. CONCLUSION

1. I have summarized the activities of the Japanese Patent Office (JPO), the Japan Institute of Invention and Innovation (JIII), and the Japan Patent Information Organization (JAPIO), in terms of

(i) popularization and public relations concerning the patent system,

(ii) encouragement of inventiveness, and

(iii) dissemination of patent information.

Moreover, I would like to mention that there are a total of 3,400 patent attorneys in 2,000 patent offices in various parts of Japan. They have been conducting many kinds of consultations relating to industrial property, serving as a valuable intermediary between JPO and inventors.

2. In Japan, one important feature of our system is that the related organizations of JIII and JAPIO function effectively with JPO in implementing a variety of activities. Industrial property has broadened into many fields.

As explained before, promoting inventive activities requires numerous efforts including popularization and public relations concerning the patent system, encouragement of inventiveness and dissemination of patent information. Carrying out such activities by the government itself would require an enormous amount of personnel and others. On the other hand, from the viewpoint of the public interest and non-profitability of these activities, it is not appropriate for the private enterprises to undertake such activities. Accordingly, the adoption of such forms of affiliated organizations of the government will make it possible to carry out those activities without harming the public interest while making good use of private funds and capability.

Japan has more than 100 years of history in the industrial property field and I have so far explained activities in Japan to promote inventiveness. I hope that some of the activities I have mentioned will be of help to you.

3. As far as improvement of the industrial property system itself is concerned, I think it is useful to study and make good use of the system, practice and experiences of other countries.

At this time, industrial property is at different stages among the participating countries. And I assume that each country's patent office has its own difficult problems to be solved. For example, Japan has a great concern in expediting the examination process at present. Aiming at this improvement, we have been making utmost efforts to increase the number of examiners, to promote automation and so on. In dealing with various problems, it is important for each country to learn from other countries which have already experienced such problems and to cope with them in cooperation with individual countries. I sincerely hope that this Symposium will provide us with a good opportunity for this.

4. Now, as international harmonization of systems and their operation becomes necessary corresponding to the globalization of the world economy and to the continuing development of science and technology, it is first of all necessary to make the GATT and WIPO discussions successful, and to create systems and operations that meet the times.

In order for industrial sectors to make effective use of industrial property systems, it is, I believe, quite vital for each industrial property office to coordinate and implement the activities of (1) popularization and public relations concerning the patent system, (2) encouragement of inventiveness, and (3) dissemination of patent information.

Thank you for your kind attention.

THE INDUSTRIAL PROPERTY SYSTEM AND THE PROMOTION OF INVENTIVE ACTIVITY: ROLE OF THE INDUSTRIAL PROPERTY OFFICE

by

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INTRODUCTION

Whilst the title of this paper refers to the promotion of inventive activity, the content of the paper will not focus on this aspect but rather on the innovation process. The reason for this is rather simple. What is important is not so much the encouragement of an inventive product, important as that may be, but rather the production of a new saleable product, that is the successful commercialization of a new product. The promotion of inventive activity to produce innovations capable of commercialization should be the aim of all countries with a determination to develop new industries and increase the profitability of existing industries. In this regard this paper will equate the innovation process with technical and economic progress.

THE INDUSTRIAL PROPERTY SYSTEM

Industrial property relates to creations of the human mind. Typically such creations are inventions, industrial designs, utility models and trade marks. There has been some justification based on natural law for the protection of industrial property, which is reflected in Article 27(2) of the Universal Declaration of Human Rights, which states:

> "Everyone has the right to the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author."

Economic justifications have also been advanced to explain the protection of industrial property rights. The patent monopoly, in particular, has as an economic justification been represented as an indispensable reward for innovation, research and development. Trade mark rights protect undertakings against unscrupulous competitors seeking to make a profit out of deceiving the public.

The development of the industrial property system involves a compromise between a number of competing interests. These have been described by Ladas in his work "Patents, Trade Marks and Related Rights, National and International Protection" as follows:

> "(a) the interests, demands, and claims of those who have invented new products or processes enriching our life, or who have created new designs ornamenting and beautifying our products, or who have

adopted trade marks, trade names, or other distinguishing elements by which they identify their origin and guarantee the standards of products we buy;

(b) the interests, demands, and claims of competing inventors, designers, manufacturers, or merchants who may have made similar inventions or designs or adopted similar trade marks or distinctive devices or who wish to use discoveries or creations or symbols of others as effective instruments for the promotion of their interests;

(c) the interests and claims of the community that wishes to prevent undue or excessive monopolies or restraints between those competing in the market and to gain the advantage of untrammelled competition and low costs of the good things of life;

(d) the interests and claims of the public who wish to avoid being deceived as to the worth or genuineness of what they buy and not to be the victims of fraud, confusion, and mistakes;

(e) the interests of the social and legal order of the country which would be fatally injured if it would cease to encourage the spirit of invention and creation and if it would permit unlawful competition and free use of the creative work of others."

Thus it is seen an industrial property system is established to serve the needs of traders, manufacturers, industrialists, researchers, businessmen, consumers and governments in ensuring economic and technical progress, and it must be noted that the benefits to be derived from an effective use of the system cut across sectoral boundaries within an economy. One of the essential tasks of government is to ensure that the main components of the industrial property system are developed and successfully exploited in commerce and industry so that the system may better serve the national interest and national goals of development.

It may now be instructive to focus on the component of the industrial property system which arguably contributes most to the promotion of innovation, namely patents.

If we look back to the historical development of patent protection we might see the influence of government on innovation, scientific research and on the development and introduction of new technology. A study of the historical development points to a correlation between industrialization and patent protection. The promotion of industry and trade was, as it is now, one of the primary objectives of governmental economic policy in the era of the industrial revolution. This is reflected in the history of the first patent laws in, for example, Venice, England, France and the United States of America. The law makers expressly stated that the protection of new and useful inventions was either, an economic necessity in order to promote domestic manufacture and to give an incentive to industriousness, or was a mechanism of promoting the progress of science and useful arts. The patent system has continued in all countries even though fundamental political and economic upheavals such as the French Revolution, the Declaration of Independence of the United States of America, the Russian Revolution and the changes brought about by the formation of the European Economic Community have occurred.

Developments this century in both Israel and Japan, for example, support the view that there is a correlation between high levels of economic development and strong patent protection. Studies have indicated that the technical progress achieved in these countries in the last 50 years would not have occurred with the same speed, without effective patent protection for foreign technology and without an active licensing policy based on this protection.

An historical study will also reveal the legal and economic goals and functions of the patent system, namely recognition of intellectual activity and provision of material benefits to the inventor, incentives for the investment of money and effort in research and development and inventive activity, creation of a favorable climate for the transfer of technology by means of the security it provides for the patent owner, and the dissemination of technological information.

A study of political and economic systems in different countries reveals that the creation of technical innovation and the protection thereof via the industrial property system has a high priority in terms of economic policy in both market economy or centrally planned economy countries. Measures can be seen in both these groups of countries which aim to provide effective protection of inventions in return for the disclosure of technical information. The ultimate objective of these measures is the advancement of technological progress and the development of society.

THE INNOVATION PROCESS

In order to successfully improve a nation's performance with respect to innovation and thus technical progress, there needs to be a more thorough understanding of the innovation process itself. Innovation is not invention. Innovation is not equivalent to the generation of original ideas, technology breakthroughs, research and development, or the first application of technology. Invention or inventive activity is simply one integral component of the innovation process which also entails the successful commercialization of a new product.

Research and development leads to invention. In order to obtain economic benefits from research, inventions and other research outputs must be commercially exploited. Commercialization is the successful market introduction of inventions and other research outputs. Innovation is marked by first real use in a market and may be expressed as a simple equation, that is to say:

innovation = research + development + commercialization.

Competitive pressures will consistently force undertakings to upgrade their systems and products, to find better and/or cheaper ways of doing things. In this way they create a comparative advantage over their competitors through new product designs, new production processes and new marketing approaches. Successful innovators are the first to bring their new products or services to market and introduce more new products than their competitors. Such innovators regard the innovation process as a complex

system of stepping stones. At each of these steps the management skills that come into play may be totally different from those that were instrumental in making the preceding step. The availability of adequate finance is a crucial precursor to each successive step and is often not sufficiently taken into account.

What is rarely acknowledged is that commercialization is far and away the dominant and major factor in the innovation process. It is in the commercialization of an invention that most of the project effort is absorbed and the majority of funds expended. A brilliant invention that is poorly commercialized may well result in nothing, whereas an average invention that is well commercialized will produce a saleable product. There are numerous examples worldwide where the effective commercialization of a technically less than perfect solution has dominated the market.

Many technically successful R & D projects with obvious commercial potential do not lead to successful commercial production. This should not be surprising when consideration is given to the wide range of skills, infrastructure and financial resources that have to be mobilized and effectively integrated before R & D results can be commercialized.

One common reason for failing to successfully commercialize research outputs is the gross underestimation of the costs of doing so. Commercialization is very expensive and research is cheap by comparison. Studies recently conducted in Australia have indicated that, typically, if you spend one dollar on research, you should expect to pay 10 dollars on development and 100 dollars on commercialization of the outputs of that research.

Not only is commercialization very expensive, it is also very risky. Commercialization is generally a more complicated process than research. Because commercialization involves many more participants, and is subject to the vagaries of the market and actions taken by competitors, the risk of failure is greater than the risk of technical failure of the research. Moreover the consequences of failure are greater, in that the amounts of money involved may be orders of magnitude greater than those involved in research.

THE IMPORTANCE OF THE PATENT SYSTEM TO THE INNOVATION PROCESS

The patent system has certain advantages as compared to any other government system of promoting innovation including research and development. It encompasses, in principle, all areas of technology and thus promotes technical progress on a broad scale. It is simpler and less expensive because the grant of patent rights does not cost the government anything and has important effects on the total process of innovation from research and development through to commercialization, and on the dissemination of technological information. Contrast this, for example, with systems of government research grants and rewards.

The fundamental reason for these effects lies in the exclusive nature of the patent right. The exclusive right assists in a variety of ways. It influences the willingness of an undertaking to invest in new technical developments. Thus it stimulates research activity which ultimately produces

invention. That is to say it provides an incentive to the creation of new technology. The exclusive right assists in the commercialization of the outputs of research by enabling the creator of the invention to work it without interference from imitators who have not incurred the investment in research and development which produced the invention. The inventor and associated investors are thus able to recover research and development costs through the comparative advantage which the exclusive rights to exploit the invention confer. It thus provides a climate conducive to investment in bringing new technical advances to the market place. The exclusive nature of the patent right enables the products of research to become a tangible good. This allows, in addition to its exploitation without risk by an undertaking, the assignment or licensing to others, thus permitting the patent to act as a legal instrument facilitating the spread and transfer of technology.

In summary then, in addition to providing an incentive to the creation of new technology, the patent system also facilitates the development of inventions from the initial stage of an idea through to its commercialization, which as indicated above is where the greatest investment and risks are. The patent owner is protected for a limited time against the uncontrolled competition of those who have not taken the initial financial risk associated with the creation of the invention. It thus provides an environment in which risk capital may be safely advanced for the transformation of the results of research into a commercial process or product. If resources are to be put at risk to develop a new process or product, which has yet to be proven, an inventor, researcher and investor may hesitate lest the expense of the development prove to be irrecoverable, while competitors can wait and, without equivalent expense, pick up and use the successful results. It is the knowledge that a patent will enable them to hold off competition for a period, which encourages researchers and entrepreneurs to take the risk and use financial resources to commercialize the outputs of research.

THE IMPORTANCE OF OTHER COMPONENTS OF THE INDUSTRIAL PROPERTY SYSTEM

Much of what has been outlined above in respect of the patent system is also applicable to the industrial design and utility model systems.

With respect to trade marks, an integral component of the commercialization of the results of research is product identification in the market place through the utilization of a trade mark. A trade mark is an essential tool for the marketing of new products. A trade mark identifies the source of a product, distinguishes it from competing products, enables a prospective purchaser to relate advertising to the product as displayed and offered for sale, and makes possible the repeat purchase of those products which have satisfied the consumer. A trade mark can substantially assist in the commercialization and circulation of a new and innovative product by providing positive product identification to the purchaser. Economic efficiency may be stimulated by the promotion of full consumer information on available products.

Trade marks can also make a direct contribution to technical progress through the production innovations necessary to secure consistency in quality. These developments may be promoted by trade mark licenses which provide the importation of know-how necessary to secure quality control.

THE ROLE OF THE INDUSTRIAL PROPERTY OFFICE

An industrial property office should have the objective of ensuring that the industrial property legislation is relevant to current needs of a country. In this regard it needs to ensure that appropriate protection is available not only for existing technology but also for new or emerging technologies. It also needs to ensure that the system for enforcement of rights which operates in the country is such that individuals and small or medium-size enterprises are not deterred from invention and innovation by fear of the cost of litigation which can be involved in safeguarding their rights. It therefore needs to ensure that any litigation system is simple and gives the possibility of speedy resolution in disputes. If any of the foregoing objectives fail to be properly addressed, there is the strong possibility of a loss of confidence in the industrial property system, and, without confidence, the system's use and its ability to beneficially impact the innovation process will, in all probability, decline.

It is useful now to focus on certain specific activities of an industrial property office in its role in encouraging innovation.

There are four major areas of endeavor in an industrial property office which have some impact on the innovation process. These may be grouped as follows:

- examination of patent applications and enhancement of reliability of granted patents--the patent granting process;
- information dissemination;
- trade mark registration;
- international activities.

Patent Granting Process

Perhaps the most important function of an industrial property office, insofar as it relates to the innovation process, is the administration of the patent legislation in the granting of patents for inventions. The office is responsible for scrutinizing patent applications to determine if the inventions disclosed therein are entitled to patent protection according to the legislation. The patent, if granted, must involve an invention which is both new and contains an inventive step, and must have claims shaped and formulated by the examination process so as to specifically define the advance in the technology made by the inventor. It should be noted that the industrial property office has no jurisdiction over questions of infringement and the enforcement of patents, nor over matters relating to the promotion or utilization of patents. Thus the focus is on the patent granting process.

The reliability and certainty of the product which results from that process--the patent--has a major effect on the innovation process in the sense that it determines public confidence in the patent system as a whole. When public confidence in the reliability and certainty of granted patents is strengthened, that is, the presumption of validity is increased, the incentive

effects of the patent system--to invent, to disclose new information to the public, to commercialize new ideas and to invest in research and development--are enhanced.

It is unfortunate, but nevertheless true, that patents are at times held invalid by the courts in the light of evidence of which the industrial property office was unaware during the examination process. It should be a primary objective of an industrial property office to implement policies to ensure that all relevant information is brought to notice during the pre-grant process and, if not, to provide some mechanisms by which further examination may be facilitated. A major benefit to the innovation process derived from increased confidence in the reliability of granted patents is a corresponding decrease in the cost in terms of money, time and effort, of patent litigation.

A wide variety of actions are presently available to industrial property offices to give effect to the primary objective just stated. Besides the actual examination of an application to determine novelty and the presence of an inventive step, certain laws also permit:

- notification by third parties of prior art;
- pre-grant opposition; and
- reexamination.

These three possibilities permit third party participation in the patent granting process in a manner consistent with statutory limitations. In each of these situations, third parties have the opportunity to bring to the attention of the industrial property office, details of prior art which they feel are relevant to the patentability of an invention. This allows the industrial property office to consider matter which it might otherwise not become aware of during the granting process.

With respect to the examination of novelty and inventive step, industrial property offices strive to ensure the integrity of their search files and to improve access to the vast number of patent documents which constitute their search base. The search files are established for the purposes of carrying out documentary searches necessary for the examination of patent applications and for retrieving the documents relevant to specific technical fields. Special systems of classifying are required to permit the economical handling of patent documents within an industrial property office, and the greater the number of documents, the better the system of classification has to be.

It is important then that industrial property offices have an ongoing program to review periodically selected portions of the search file to determine the need for more precise classifications which better correspond to the current state of technology and its contemporary terminology. Such ongoing programs constitute an in-depth analysis of all national patent documents in the search file in a given technology so that each re-classification program increases access to, and reliability of, the search base.

Additionally, industrial property offices are making greater use of computerized searching systems and machine-readable patent databases in other countries.

Information Dissemination

An important means of strengthening the technological base of a country and hence its potential for greater technical progress--besides the creation of new technology--is the acquisition of existing technology by transfer.

The public's part in the patent contract is the technological information the inventor must disclose to obtain the protection offered by a patent grant. Besides the incentive to invent and invest which the patent system provides, the technological information in patent documents is the system's principal product. Studies have shown in the United States of America, for example, that 84% of US patents contain details of technology not available in the non-patent scientific literature. Thus, so far as the innovation process is concerned, it should be noted that the technology disclosed in patent documentation may serve to stimulate ideas for further inventions and innovations.

The exclusive rights which are conferred by the grant of a patent relate to the commercial exploitation of the invention, and do not usually preclude others from experimental work on the technological information contained in the patent document. Furthermore, the exclusive rights are granted on a technical and not on a market basis. In other words, while the patent owner is protected against those who use the same technology as is revealed by the definition of his invention in a patent claim, he is not protected against those who derive from his disclosed invention, a perception of a market need which may be satisfied by the legitimate adaptation or improvement of his technology, or through the discovery of a different technical means of satisfying the same market need.

Industrial property offices therefore have adopted a variety of ways of disseminating patent information to enhance the innovation process. Examples of these are:

- the creation of regional search centers equipped with at least all national patent documents and in some cases patent documents from major industrialized countries;

- the provision of public access to a wide variety of computer-based patent information, derived either locally or from foreign databases;

- the promotion within the small business community and industry of the greater use of patent information in pre-research investigations and for problem-solving;

- the encouragement and fostering of training in patents and the use of patent information in tertiary education programs in science and engineering;

- the promotion of the use of the patent search base as a source of appropriate technology, especially to aid small business;

- the creation of an extension or information service which would offer to industry, small business, etc., expert assistance to obtain from the patent search base, technological information to support the innovation process;

- the provision of a specialist service in the area of technology assessment and forecast, and industrial planning particularly in the statistical aggregation of patenting activity as revealed through published patent documentation; and

- the entering into cooperative dissemination ventures with private sector organizations with the aim of ensuring more efficient and economic availability of a variety of patent information products and services to industry.

Trade Mark Registration

The ultimate output, generally speaking, of the innovation process is a new or improved product. A return on the financial investment in the innovation process is achieved through the sale of that product in the market place. The trade mark serves to identify the source of the product and guarantees to the producer the benefits in terms of reputation and goodwill which accrue as a result of the innovation. The protection accorded by trade marks, which is enhanced by national trade mark registration systems, enables the innovative producer to prevent others from appropriating his acquired goodwill through infringement of the trade mark right. This protection provides an improvement of the market position of domestic undertakings as well as providing a strong incentive to create new products and to innovate improvements in existing ones.

Most countries permit an application to register a trade mark, which is based on an intention to use the mark, to be filed. The filing and expeditious examination of a trade mark application will thus provide innovative firms with a means of determining the effectiveness of a selected mark to clearly identify the source of a new or improved product prior to the commitment of advertising, promotional and sales expenditures. Some industrial property offices provide an advisory service prior to filing an application for registration, as to the registrability of a mark.

International Activities

The broad objective of a country's foreign policy in the industrial property field is to provide more effective protection of the industrial property rights of its nationals throughout the world. Facilitating the international protection of industrial property has the potential to greatly impact on the innovation process. Export sales and returns on foreign investments supported by industrial property protection in foreign countries frequently provides the additional income necessary to support domestic R & D expenditures. So do royalties from the licensing of technology in countries where neither export sales nor direct investment is feasible. Industrial property offices have a role to play in pursuing this broad foreign policy objective. Ways in which this has been achieved in more recent years is the conclusion of the Patent Cooperation Treaty, and the current negotiations in WIPO on harmonization of patent and trade mark laws, and in GATT in the context of the TRIPS Agreement.

CONCLUSION

This paper has focused on the innovation process because what is important to a country's economy is not so much the encouragement of an inventive product, but rather the successful commercialization of a new product. The industrial property system has been shown to be an important contributor to the innovation process by providing an incentive to invest in the three stages of innovation, namely, research, development and commercialization. An industrial property office should have the objective of ensuring that the industrial property legislation is relevant to the current needs of a country. Appropriate protection needs to be available for new and emerging technologies as well as existing technologies. It also needs to ensure that the system for enforcement of rights is such that individuals and small or medium-size enterprises are not deterred from invention and innovation by fear of the cost of litigation which can be involved in safeguarding their rights.

If any of the foregoing objectives fails to be properly addressed, there is the possibility of a loss of confidence in the industrial property system, which in all probability will result in a decline in the system's impact on the innovation process. An industrial property office can address the above objectives in four major ways. First, the enhancement of the validity of granted patents increases the incentive effects of the patent system, namely, to invent, to disclose new information to the public, to commercialize new ideas and to invest in research and development. Second, the dissemination of the technological information contained in patents strengthens the technological base of a country and enhances the innovative process. Third, the expeditious examination of applications for the registration of a trade mark provides innovative firms with a means of determining the effectiveness of a selected mark to clearly identify the source of a new or improved product. Finally, the facilitation of international protection of industrial property has the potential to greatly impact on the innovation process. For example, export sales and returns on foreign investment supported by industrial property protections in foreign countries frequently provides the income necessary to support domestic research and development programs.

TOPIC 2

THE ENCOURAGEMENT OF INVENTIVENESS IN ENTERPRISES

by

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"Give me a proper fulcrum," said an ancient scientist, "and I will move the earth." Fortunately, there is no proper fulcrum in outerspace yet, otherwise some fool would really try to move the earth--but there are not many ways in which we do not think of modern technology. No sphere of human endeavor from housework to agriculture is untouched by science, applied creatively and innovatively.

There is an explosion of technology and the pace of this is increasing relentlessly. Ninety percent of all the scientists who have ever lived are still alive today. All the scientific knowledge of the world of many countries doubled in the first 50 years of this century. It has again doubled in the last 30 years, and current reckoning is that it will double again in the next 10.

In this era of exploding knowledge where intellectual property assumes the position of a crucial valuable asset, how does one encourage it, and then how does one protect it?

Innovation and creativity--the cornerstones of growth--require a free environment. Protection of the intellectual property requires regulations, controls and procedures. Seemingly there is a dichotomy between the two. A difficult path. How to encourage inventiveness, innovation and creativity, and still afford protection without curbing this intellectual activity?

We cannot escape the impact of these developments and, therefore, must learn how it affects our daily lives and learn how to prepare for it and how we might possibly control it.

Industrial progress depends on new inventions and on innovation, which are based on better restructuring or upgraded technology.

Many entrepreneurs are of the view that innovation is the keystone of industrial advancement. Companies that have progressed and maintained their product or service leadership have innovation as one of the primary corporate objectives.

Theodore Levitt advocates a pragmatic approach: "Improve on somebody else's mousetrap." He says: "Looking at some of today's industrial leaders and top innovators, IBM did not invent the computer, nor Holiday Inn the motel, nor Texas Instruments the transistor, nor McDonald's the fast-food eatery." They became innovative leaders by improving on someone else's "mousetrap" without in any way seeking recourse to duplication.

You do not have to reinvent the wheel if you can improve on it for better performance.

The leadership of many innovated products cannot easily be upset by followers. After decades in the ready-made garment industry, Levis Strauss Co. is still the market leader, Textron's Talon Zipper is unchallenged in slide fasteners, E.I. du Pont de Nemours & Co., the pioneer of man-made fiber, still holds sway over 50 percent of the nylon market. Gillette blades have not lost their edge. Philips and Braun continue to dominate the electric shaver market. Johnson & Johnson continues to be the leader in health-care products.

With the globalization of business a very exciting era is emerging, but it is getting tougher to create excellence.

Today's business environment is increasingly characterized by:

(a) turbulence,

(b) fundamental changes in consumer behavior,

(c) intensified domestic and global competition,

(d) radically fluctuating costs of borrowed funds,

(e) accelerated technological breakthroughs and rapid obsolescence,

(f) economic uncertainty,

(g) constantly shifting markets, and

(h) increased government interference.

Today's executives must therefore bear unprecedented burdens, and the managers' role has largely become unstructured and open-ended. Fast responses, agility, nimbleness and instant decision-making are called for. Managers are also required to help in creating an environment which allows for opening up of minds and encouraging creativity and innovation.

One of the common threads that ties world-class companies together is their ability to innovate on a continuing basis. The emphasis is "collective innovation" over "individual innovation." The collective capacity to innovate is seen to be greater than the sum of its parts. This integrative thinking is associated with the willingness to move beyond received wisdom, to combine ideas from unconnected sources, to embrace change as an opportunity to test limits.

Success-oriented, positive and innovative companies must also have a substantial tolerance for failure. James Burke, J&J's CEO, says one of J&J's tenets is that "You have got to be willing to fail. You cannot innovate unless you are willing to accept mistakes. You cannot innovate unless you <u>make</u> mistakes." Tolerance for failure is a very specific part of company culture and that lesson comes directly from the top.

The organization committed to innovation must ensure that:

(1) decision-making is decentralized;

(2) there are team-based rewards as well as individual rewards;

(3) there is a separate career path for innovators;

(4) training is constantly upgraded and there is a continuous organizational learning;

(5) people are exposed to constant internal and external challenges;

(6) there is corporate slack;

(7) there are innovator/customer interaction mechanisms; and

(8) there is employment security.

Competition gives a spur to innovation and creativity. But while looking at creativity, one must not forget that ideas are fragile. They are like tiny unimportant things--like seeds. They are propounded hesitantly by someone who has no proof that the idea will work, and attacked vigorously by people who are on much stronger ground knowing that the existing method will.

As soon as an idea is brought into the open, someone usually challenges it--"Why do you say that?" And the person who has uttered it is embarrassed because he cannot immediately come up with five good reasons why it is a good idea. Such supporting thoughts will come--later--<u>if</u> the idea is allowed to germinate.

Rigidity and uniformity are built into every aspect of industry. Especially in the engineering disciplines, we demand that every article coming off the production line be identical to every other article. As a result the same habitual routine actions produce little innovation.

Unfortunately, much of our formal education teaches us to be critics. The student who rips a thesis apart or criticizes a thesis is rewarded. Thinking down is easy. But does our system reward a person who "thinks up" which is so much harder? Seldom is there a course on opportunity-finding.

Various studies have indicated that the primary motivation of the inventor and the enterpreneur is not immediate or direct monetary benefits. Such individuals seem to be driven more by a sense of accomplishment and a desire to serve than by ultimate monetary reward.

Business research reports and a survey by <u>Exchange</u> magazine indicate that on the average of 10 businesses starting out, only one would survive beyond a 10-year period. In fact, the "half-life" of American business is only 2.6 years. That is, of 100 businesses starting out, half of them will have failed within a little over two-and-a-half years. Yet, in spite of that, tremendous amounts are spent on R & D and tremendous initiative taken.

Technical innovation is necessary for new product creation, and new products are necessary for company growth and survival. In industries such as electronics and plastics, it has been estimated that 50 percent or more of current sales are in new products that did not exist 10 years ago. Ten years from now, 50 to 70 percent of the sales volume of these companies will be in products which do not now exist.

A study by the Stanford Research Institute discloses that three factors have contributed to the rapid growth of the national economy of the United States of America since 1900:

(1) expansion of labor inputs accounted for only nine percent of the total growth;

(2) increase in the national capital investment contributed about 33 percent; and

(3) technological progress accounted for 58 percent.

Other studies have concluded that technology has contributed as much as 80 percent of total growth. But whatever the exact figure, it is now established that technology in its many manifestations--including education, improved products and processes, and better management--makes a spectacular contribution to economic growth.

Management today has become a "science" and the emphasis lies in planning, organizing and controlling for increased production. Effective administration tends to snuff out deviation from set patterns--it becomes most important to produce to a set rule and to conform. Rules, regulations, forms and procedures--all kill initiative and destroy the innovative self, yet they proliferate as an organization grows.

For creativity suspension of judgment is necessary. Creativity and logical analysis are poles apart. Logic can contribute greatly to an analysis, but unfortunately logic is used mainly for one thing: "Post mortem." Creativity is different--it is used for stepping on to a new ground.

Building within a company, or a country, an environment which can support innovation requires a cooperative and conscious suspension of judgment. We need to hold back those swift chops of logic that kill the innovative thought, the innovative idea, before it can take root.

Most persons are resistant to change. A committee even more so for it brings the collective opposition to the fore.

Someone developed a rule and called it Rule 816.

Rule 816: Relating to New Ideas

Rule 816 is now in effect until further notice. When confronted with a new idea, vote against it.

Rationale:

1. It is probably not a good idea; new ideas seldom are.

2. Even if it is a good idea, the chances are it will never be tested.

3. Even if it is a good idea and even though it is tested, chances are that it will not work the first time.

4. Even if it is a good idea, and even though it is tested, and even if it succeeds, there will be plenty of time for thinking up alibis.

Therefore: When confronted with a new idea, the rational action is to take a positive and forward-looking stand against it.

For innovation and creativity you need freedom of thought. Not circumscribed by organized thought, but allowed to travel free to question, to dream, to have flights of fancy. Not logic. Logic defeats creativity. Yet in an organized society and structure, one cannot be totally free. How then does one prevent these dichotomies?

In universities and research organizations one can work on the abstract and on new thoughts, do research on untried areas without necessarily awaiting assurance of returns. But with the brutal competitive pressures of today, not even forward-looking businesses can afford to give total freedom and allow unlimited open-ended research.

Some individuals are endowed with creative minds. Thomas Edison Bell, Buckminster Fuller, Ed Slocum (the Bhakra Dam designer), all had creative minds. Many had limited formal education and had dropped out of formal educational establishments. Dr. Edwin Land of Polaroid, Stephen Jobs and Stephen Waznaik of Apple Computer are other well-known figures who have revolutionized ways of life through their creative approach.

These were people who had a dream, a vision. And then the tenacity and perseverance to carry them through.

In other cases, dedicated research, step by laborious step, was done in developing and building on the fundamental research done by others. This is what has given results. As an example, the development of VLSI chips has been based on the patented planar process. Without this patent this development could not have taken place. Similarly the basic invention of fiber optics has been a great achievement as numerous uses and applications have been found based on this development.

The more creative and fertile the mind the more the opportunities of building another development.

Take some examples of creativity:

A composer uses only the 12 notes of the musical scale, yet by creative thinking rearranges them into thousands of different musical tunes and scores.

Chess players, playing with only 16 pieces each, can create unlimited moves.

Painters, working with only three primary colors (red, yellow and blue) plus the basic white, can create millions of different beautiful paintings.

Man's mind makes infinite variations possible. Every second a new situation occurs, demanding a new solution. Even in management education new theories are emerging. One of the world's top rated business schools, Kellong of North Western University, has a new theory. The rate of obsolescence of knowledge is so high that educating people by the famous Harvard case study method is now considered obsolete as it takes too long and new situations (never similar) are emerging with such great rapidity as to make the previous case almost obsolete.

But creativity and innovation can be improved and expanded. Creative people are "opportunity thinkers." Actively creative people develop a heightened ability for seeing an opportunity in any situation.

For example take the child's question: "Where do the stars end?"

Creativity is like that--infinite!

Diversity also stimulates creativity. With a powerful, dynamic and positive thinking group, the creative potential far exceeds what the individual can do alone. E. Wharton states this beautifully by saying:

"There are two ways of spreading light,
To be the candle or the mirror that reflects it."

And Arthur Conan Doyle adds:

"It may be that you are not yourself luminous,
But you are a conductor of light."

In the same vein, Henry Ford has talked of the importance of planting an idea by saying that:

"The wisdom of life is to keep on planting for the sown seed goes on growing, whether we remember it or not."

Creative thinking involves the ability to find solutions to problems by changing your point of view when normal channels fail to give you the answers you need.

Creativity is in the mind. Locked in place. But with infinite potential--if released.

To generate ideas for meeting creative challenges, it is vital to trust the role of the subconscious. You will be the more creative by surrendering your challenge to it, believing it will give you the solution you need. If you make a commitment wholeheartedly, your subconscious mind will not let you down.

Also one must be emotionally involved. Another dimension is one of divergent thinking which is essential for creative thought. As a corollary, one must then consider forcing certain opposite relationship, for all solutions are not only black or white. There are many shades of grey.

In our minds we have two personalities. That of a judge, an analytical logical thinker, and that of a child--a free thinker, unconstrained by logic and experience. Divergent thinking has a "loose relationship with logic." It can, in fact, be quite illogical. It is the kind of thinking that children do without self-consciousness, and which we adults write off as childish.

In being creative we need to re-capture the child-like feeling and spirit, and to be able to suspend the judge-like decisions while allowing creativity to grow.

"If you want to succeed," John D. Rockfeller Sr. said, "you should strike out on new paths rather than travel the worn paths of accepted success."

Innovation--the purposeful application of new ideas--underpins the success of the winning performers. Successful companies innovate early and often, and that is what gives them the competitive edge. Winning companies innovate continously.

In 1969, Barger, President of Dynatech Corp., observed--"Product cycles will grow shorter and shorter. Any company in a single product would not be in business long."

It is the creation of an environment where innovation and creativity flourish that is most important. Most management processes inhibit rather than facilitate this innovation. And for those connected with the protection of intellectual property rights it becomes a difficult and unenviable task to strike the right balance.

Peter Drucker has this to say:

> "Tomorrow's business leader, it is clear, will need to be able to organize for entrepreneurship... will have to know how to anticipate innovation and how to make innovation economically effective."

Here are a few lessons that have emerged from watching innovation at work:

1st lesson: Innovation is technological but not necessarily technical--Edging Out, e.g. (Lenox China's Bridal Registry).

2nd lesson: Innovation and bureaucracy just do not mix. Small teams and individuals, not massive projects, have brought innovation.

3rd lesson: Winners regard their customers and distributors as welcome partners in the innovation process.

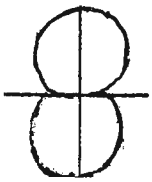
4th lesson: Creativity must be highly valued and effectively promoted.

Innovation continues among the winning performers--both in new products and in new markets--often by shifting to new ways of doing business, for instance, different production methods or different ideas on selling. This was interestingly explained by Peter Drucker who said: "Selling refrigerators to the Eskimos to keep food cold is one thing, but selling refrigerators to the Eskimos to keep food from freezing is creative."

The human brain has two sides--the left and the right. Ninety percent of the people develop the left side. The right side is the one which serves the creative function. Whichever side you use gets stronger. If you do not exercise it, it gets flabby. You can change the 90:10 proportion to 70:30 and that is a good percentage.

Here is a technique. If someone was to ask you "What is half of eight," what would you reply?

3, or 0, or 4?



Most people would say "4" but it could be any one of the three, depending on how you looked at it.

While thinking creatively, we must also learn to listen to one's own and other people's innermost thoughts, thoughts that may appear illogical at first. By crushing these thoughts, you discourage creativity forever. Instead, it would help if you could say: "Boy--it is creative." For most people believe that the amount a person uses his/her imagination is inversely proportional to the amount of punishment received for using it.

In summary then, a new thrust is being given to internal corporate entrepreneurship which champions innovation and vision.

Today the pressure is to perform. Competition is fierce. Technological obsolescence too rapid. And there are many paradoxes to be addressed. While most of the successful business leaders are tough as nails and uncompromising about their value system, they generally are people with tremendous vision, and a respect for values. They are also innovative and creative in their approach. While some leaders are more aligned with creativity and do not have time for details, the paradox is that there are others who succeed because details are important.

To succeed, we must confront this paradox of allowing creativity to flourish, and yet spend the right amount of time on detailing and working within a formal structure.

Today's environment requires constant innovation, and to achieve this we must get away from the passive paths of the mind.

THE ENCOURAGEMENT OF INVENTIVENESS IN ENTERPRISES

by

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I. INTRODUCTION

The aim of the paper I have the honor to present to you is not to give a systematic scientific survey comparing the different methods used or even thought of around the world to encourage inventiveness. What I intend to speak about are experiences we had and methods we are using within the Siemens Group, especially as far as the Patent Department is involved.

You may know that Siemens, i.e. the German Siemens AG and its subsidiaries in Germany and in many other countries, is one of the major enterprises with worldwide business activities in almost every field of electrical engineering and electronics. The worldwide annual sales amounted to more than DM 73.1 billion within the last fiscal year. About DM 7.8 billion were spent for research and development. The total workforce amounts to about 402,000 employees, about 243,000 of them in Germany.

The Intellectual Property Department of Siemens AG, a main department of Corporate Research and Development, and the Patent Department, which is the major part of it, are directly responsible for all intellectual property operations, especially patent operations of Siemens AG, some German subsidiaries and those foreign subsidiaries, which do not have their own intellectual property or patent department. But also for those subsidiaries the Intellectual Property Department and the Patent Department of Siemens AG have a functional responsibility with a competence to issue guidelines in intellectual property and patent matters. The Patent Department of Siemens AG has at present about 140 patent attorneys (trainees included). Smaller regional or local intellectual property or patent departments respectively are located in the United States of America, Sweden, Austria, Switzerland, Great Britain, France, Italy and Brazil.

II. IMPORTANCE OF INVENTIVENESS FOR SIEMENS

Siemens business is mainly a high-tech business with steadily shortening product life cycles. At present about 50% of our products are younger than five years. Therefore, inventiveness of the employees, especially of those working in R & D, is of vital importance for Siemens. Without the ideas emerging from the brains of its employees Siemens could not stand up against the worldwide competition for a longer period of time.

But inventiveness is also of vital importance for the employees themselves, especially those working in R & D. Without inventiveness they could not fulfill their obligations. As a consequence their own jobs and the jobs of their colleagues in other departments would become endangered and finally lost.

This situation is very well recognized by the Siemens management and all is done to promulgate the respective knowledge and feeling right down to the single employee throughout the company.

Along with a major reorganization of Siemens, six basic corporate principles were published in May 1990, two of them referring to technical leadership and creativity.

> "We want to belong to the world's most competitive enterprises in the field of electrical engineering and electronics, and to be in the vanguard of technological progress.
>
> "Our employees' creativity and determination to succeed are the basis for our business success."

But it is not enough to formulate corporate principles. Those principles have to be converted into concrete policies of groups, divisions and departments.

And, if the results of the employees' inventiveness shall be protected by intellectual property rights, the necessary funds have to be provided.

Luckily, we have not had too serious problems in that respect within Siemens AG till now. Or in other words, Siemens corporate culture has been favorable to inventiveness since its establishment in Berlin in 1847.

III. BASIC PREREQUISITES FOR THE ENCOURAGEMENT OF INVENTIVENESS

Taking my own company as an example, I have mentioned already one of the four prerequisites which I think are indispensable for the encouragement of inventiveness in enterprises, namely:

- a corporate culture favorable to inventiveness.

The others are:

- clear rules regulating the mutual obligations of employees and employers concerning employee's inventions and compensation or awards systems;

- sufficient information of employees on intellectual property matters;

- close and efficient cooperation between inventors and the Patent Department.

III.1 Corporate Culture

In very simple words, a corporate culture favorable to inventiveness exists in those enterprises where managers regard an invention disclosure of an employee reported to them as an indicator of their own successful leadership and as a positive sign of the performance of their department.

On a more advanced level, patent policies should be developed, identifying the key businesses of a company, that means the businesses with strategic importance for the future. Since resources are limited, it might be advisable to concentrate inventive and patenting efforts primarily on those fields. If basic patents are still possible in those businesses, they have to be filed very early. Reporting systems should also be introduced to control the results and the efficiency of the measures taken. We think that patent committees with representatives of technology, sales, marketing, and intellectual property are suitable bodies for the formulation of those policies and making the decisions. Also personnel management can contribute to a corporate culture favorable to inventiveness. I think it is a big incentive to inventiveness, if the number and quality of invention disclosures are drawn into consideration, when the personal performance of an employee is to be evaluated. In my company there exists a special professional line of career besides the management line. This gives the possibility to promote outstanding professionals, especially outstanding inventors, up to company ranks corresponding to middle and higher management ranks in salary and benefits but without managerial responsibilities.

III.2 Regulation of the Relationship Between Employees and Employers with Respect to Inventions

The relationship between employees and employers as regards employees' inventions may be regulated differently from country to country. In Germany, e.g. they are regulated by law, whereas they are usually regulated by contract in the United States. Since my personal experience is mainly based on the German situation, please allow me to concentrate more on this.

III.2.1 The German Law Concerning Employees' Inventions

In Germany the relations between employees and employers are, as already mentioned, regulated by law, the so-called Employees' Inventions Act, enacted in 1957. In its origins it goes back to a government decree of 1942. By comparison, the first German patent act was enacted in 1877.

The Employees' Inventions Act has 49 paragraphs. Therefore, only the most important provisions can be mentioned here, partly in shortened and simplified form.

The Act distinguishes two kinds of employees' inventions, namely:

- service inventions, and

- free inventions.

Service inventions are defined as inventions made during employment, which either originated from activities belonging to the responsibilities of the employee in the enterprise, or are decisively based on the experiences or on the work of the enterprise.

All other employees' inventions are free inventions.

An employee, having made a service invention, is obliged to report it to his employer in writing without delay.

The employer can acquire all rights to the invention by an unrestricted claim made by written declaration to the employee within four months upon receipt of the invention report.

By a restricted claim made within the same period of time the employer can acquire a non-exclusive right to use the invention.

A service invention becomes a free invention, if the employer releases it, or does not claim it without restrictions in due time.

Also a free invention made by an employee has to be reported to the employer in writing, unless it is obvious that it cannot be used within the field of activities of the employer's enterprise. The employer then has three months' time to form an opinion, if the invention is free and, possibly, to deny that it is free. Before otherwise exploiting a free invention falling within the present activities of the employer's enterprise, the employee has to offer to the employer at least a non-exclusive right of use under reasonable conditions.

As soon as the employer has acquired the rights to an invention by an unrestricted claim, the employee is entitled to a reasonable compensation.

The employer having claimed an invention without restriction is obliged to file an application for protection in Germany without delay. For a patentable invention he has to file a patent application unless, after reasonable evaluation of the invention's usability, a utility model seems to be more appropriate.

If it is in the legitimate interest of the enterprise, an invention may also be kept as a trade secret. The employer may then refrain from an application, if he acknowledges the protectability of the invention.

If the employer wants to refrain from filing an application out of other reasons, the consent of the employee is necessary.

The employer is also entitled to file patent applications on an invention, claimed without restriction, in other countries. For those countries, if he is not interested in filing an application, he has to release the invention to the employee to give the latter the opportunity to file applications under his own name and at his own expense. The employer may retain a non-exclusive right to use the invention in the respective countries and to require that existing contracts are respected when the invention is exploited in those countries. In any case, the employee is entitled to a reasonable compensation.

If the employer does not want to further prosecute a patent application or to maintain a patent on a service invention, he has to notify the employee of his intention as long as the latter's claims to a reasonable compensation have not been finally complied with, and to offer him the assignment of the rights. Also in this case the employer may retain a non-exclusive right of use against a reasonable compensation.

By the way, it is a very rare case within Siemens AG that an inventor is interested in filing an application in a country where Siemens does not want to file, or in taking over a patent or a patent application Siemens does not want to maintain or to prosecute any more.

All decisions concerning claiming, foreign filing and maintaining are made as joint decisions by at least one member of the responsible business unit and the responsible patent attorney.

III.2.2 The Employee Inventor's Compensation in Germany

Concerning the amount and calculation of the inventor's compensation the law only says that the compensation shall be reasonable and that especially the economic usability of the invention, the responsibilities and the position of the employee in the enterprise, and the enterprise's share in generating the invention shall be decisive for the calculation.

Detailed methods for the calculation are suggested in the Guidelines for the Compensation of Employees' Inventions in Private Enterprises issued by the Federal Minister of Labor and Social Order in 1959. These guidelines are not legally binding, but shall only give indications, whether a compensation is reasonable.

When I joined Siemens in 1963, we had relatively simple internal guidelines for determining the inventor's compensation. Each patent had to be classified into one class of each of three sets of classes: usability, inventor's position, and enterprise's share. By combination of the three classes the amount of the compensation could be determined. Each set of corresponding German and foreign patents, usually called a patent family, was evaluated every third year as long as one of the patents was in force.

The system had the advantage of great simplicity. The disadvantages were that the results were relatively coarse and sometimes not easy to explain to an inventor, who dropped in with the official guidelines in his pocket. Also an increasing number of court decisions became known making use of the official guidelines.

Therefore, patent attorneys started to calculate the compensation along the official guidelines, and in 1976 our internal guidelines were adjusted accordingly. Last year they were revised and a little simplified.

According to German jurisdiction an inventor's compensation is to be paid for each granted patent, if used or not, as long as it is in force, and for each used patent application.

I cannot go too deeply into the details, but just to give you an idea, I would like to explain how the compensation for a used patent is calculated. For the calculation the so-called license analogy method is preferably used. The idea of this method is, first to calculate the so-called invention value corresponding to a license fee, which would have to be paid to a free outside inventor under comparable circumstances. In a second step this value is then to be reduced by a certain amount with respect to the fact that the invention is not a free but a service invention.

The share of the invention value resulting for the employee after that deduction is determined by multiplying the invention value by a so-called sharing factor expressed in percent.

In this simple case one gets the following formula for the inventor's compensation C:

$$C = S \times L \times A$$

with S meaning the relevant sales covered by the patent during the compensation period, L the license factor in percent, and A the sharing factor in percent.

The sharing factor A will be determined by

(a) how the employee took part in the formulation of the problem to be solved by the invention;

(b) how the employee solved the problem; and

(c) the responsibilities and the position of the employee in the enterprise.

To calculate the sharing factor, each of the features (a), (b) and (c) is to be marked by points. Those points are finally added. The corresponding percentage can then be looked up in a table published in the official guidelines.

For the feature (a) one to six points can be given. For example, one point will be given, if the problem was formulated by the enterprise with a direct instruction to the solution method. Four points will be given, if no problem was formulated by the enterprise, but the employee knew about shortcomings and needs, because of his employment and having found out those shortcomings and needs himself. Six points will be given, if the employee has formulated the problem himself outside the area of his responsibilities.

To determine the points for feature (b), the solution of the problem, the following aspects are to be considered:

1. the solution was found with the help of reflections professionally familiar to the inventor;

2. the solution was found due to internal work or knowledge;

3. the enterprise supported the inventor by technical aid.

If all those features are present with an invention, one point is to be given for the solution of the problem. If none of those features is present, six points are to be given, and if all three features are realized in parts, two to five points shall be alloted.

For feature (c), responsibilities and position of the employee in the enterprise, one to eight points are available. The share of the employee decreases, the more insight he can get due to his position into the production and the development of the enterprise and the more contribution to the technical development of the enterprise can be expected from him in view of his position and salary at the time of the invention disclosure. Or, to say it in a simpler way, the higher the actual position of the inventor when making the invention, the lower finally the compensation. For example, an unskilled worker will get eight points, a development engineer four points, and the head of the corporate research laboratory one point for feature (c).

A development engineer with four points for (c) and, for example, three points for (b) and four points for (a) would have 11 points altogether. In that case the sharing factor A to be looked up in the table will be 25%.

Suppose, the relevant sales S during the compensation period were DM 3.0 million, and the licensing factor L to be applied is 2%. Then, with a sharing factor A of 25%, the development engineer will receive a compensation C of DM 15,000.

The calculation of the forementioned example was relatively easy. But many cases are much more complicated. For example, a patent may be used for more than one product and for each of those products together with a different number of other patents. In such a case the calculation or estimate of the sales relevant to each patent may be very cumbersome. Sometimes, especially in a large enterprise, it is very difficult to identify all the products covered by a certain patent.

Over the years the German Inventors' Compensation System has been developed to a highly differentiated structure by court decisions and by numerous settlement proposals of a special arbitration board established with the German Patent Office. Especially this arbitration board, which may be approached by employees and employers in case of differences before going to court, has been very efficient in settling those differences. Nevertheless, the complexity of the system is a serious disadvantage. In Siemens AG we evaluate a third of our total patent portfolio of 17,000 to 18,000 patent families every year to ascertain, if inventors' compensations are to be paid. In spite of extensive computer assistance, this evaluation requires six to 10% of the yearly working hours of our patent attorneys.

I hope you will understand that I hesitate to suggest the German system as a basis for worldwide harmonization. Further, I have some doubts if our system, under which substantial amounts of money can accumulate as an inventor's compensation over the lifetime of a patent, is more efficient in promoting inventiveness than the relatively uncomplicated inventor's awards systems customary, for example, within most US companies.

III.2.3 Regulations and Awards Programs Concerning Employees' Inventions in the United States of America

Since only five states of the USA have a legislation governing employees' inventions, most US companies require by employment contract that inventions made by an employee in connection with his employment must be assigned to the employer. Further, in the United States no extra or special compensation is required for the assignment of an employee's invention to an employer. But as an encouragement for inventors many US companies have special awards programs.

The purpose of those programs is usually expressively stated in a company policy paper.

The following are two examples out of patent awards programs of Siemens US subsidiaries:

> "The Company Invention Achievement Awards Program encourages inventors to submit their work-related ideas to the company for evaluation to ensure the protection of the company's intellectual property."

Or, at another subsidiary in more detail:

> "To encourage prompt and complete disclosure of inventions by employees and cooperation during prosecution of patent applications, it is the policy of the company to compensate employees for those disclosures upon which patent applications are filed and for which patents are granted. The compensation is an expression of the company's appreciation of employees for promptly preparing such invention disclosures and assisting in the preparation and prosecution of such patent applications, and is not payment for the actual value of an invention assigned to the company."

Under those awards programs usually financial awards and awards of more ideal value are granted to the inventors. Normally, the inventor or the inventors will receive an amount of several hundred US $ upon filing of a US patent application. Some programs provide a second payment to the inventor upon the issuance of a US patent. There are also programs with smaller payments for inventions, for which no patent applications are made, but which are published to protect the company's right to use the invention.

Usually, for each issued US patent a commemorative plaque or a certificate describing the invention will be presented to the inventors. Normally the presentation will be made accompanied by a laudatio by a member of the board of directors of the company during an annual patent awards banquet.

In case of some Siemens subsidiaries the plaque is a copper plate with the first page of the patent document etched into it and mounted onto a wooden baseplate. As I was told, especially those plaques are more highly appreciated by some inventors than the financial awards.

A survey of the compensation practice for employees' inventions in the USA, based on a questionary, was recently published by Thomas R. Savitzky in the Journal of the Patent and Trademark Office Society, pp. 645 to 679 (September 1991).

III.2.4 Group-Specific Incentive Systems Within Siemens AG

During the last 10 years the Siemens Patent Department usually has received 2,000 to 2,500 patent disclosures per year from the German Siemens Group. By an analysis of the invention disclosures of 1990 we realized that some areas of research and development with essential importance for the future business of our company were underrepresented by invention disclosures in comparison to the respective R & D-spending. A closer investigation then showed that in those R & D-areas inventions had been made but had not been reported to the company. In some cases the inventors had not recognized at all that they had made an invention. The reason was just a lack of information. In other cases, the employees had recognized that they had made an invention but, under the time pressure of their daily work, had not found or not taken the necessary time to write a report or at least to talk to a patent attorney during their working hours, and as a consequence not reported the invention at all. One should mention that especially some modern system technologies are often of such high complexity that it takes an unusual amount of time to identify and describe an invention, especially if the systems are mainly implemented in software. It became apparent that the prospect to receive the usual inventor's compensation after a number of years when the invention would be used or the patent be granted, was not attractive enough, especially for younger employees, to spend their time for invention disclosures now.

To counteract those developments special incentive system were introduced for two Groups of Siemens AG and a Corporate Division during last year in cooperation between the respective departments and the Patent Department.

The awards systems of those incentive programs are very similar to US awards systems. Therefore, I only will explain in detail one of the systems introduced for a Group of Siemens AG. The aim of the program is to increase the number of patents and utility models within the core areas of the Group's businesses.

The system is administered by a jury nominated by the Group's top management. Also one member of the Patent Department belongs to the jury.

All financial awards are granted independent from and in addition to the normal inventor's compensation.

For a patent application DM 500 will be paid per inventor. If the invention is of special economic and technical importance DM 1,000 may be paid by decision of the jury. For an invention not filed as a patent application but published through the Patent Department with the consent of the inventor DM 300 will be paid per inventor.

Special awards up to DM 10,000 may be awarded by jury decision for patent applications on inventions with extraordinary economical and technical importance. On proposal of the jury the Group's top management may decide to grant still higher awards.

For each granted German or European patent the inventors receive a letter of appreciation by the Group's top management. Inventors of yearly up to 12 German or European patents of special importance for the Group and selected by the jury shall receive special honors, e.g. a dinner with the Group's top management.

Under the special conditions of German law one may run into problems with incentive systems if too many inventions of minor importance are reported only to get a monetary award. If the employer cannot release those inventions to the inventors for whichever reasons, he usually will have to claim them without restriction, and as a consequence to file a patent or a utility model application.

To avoid this, another of our new incentive systems has been organized like a competition. When reporting an invention, the inventor may decide if he wants to compete for an award or not. If he decides to compete, he has to waive all rights granted to him for this invention by the Employees' Inventions Act with the exception of the right to the usual reasonable inventor's compensation. If the inventor decides not to compete for an award, that invention will be strictly treated according to the provisions of the Employees' Inventions Act.

Till now the special incentive systems have been in operation for too short a period that a reliable opinion could have been formed of their effects. All what can be said is that the number of invention disclosures has increased and no decrease in the quality of the invention disclosures has been observed.

III.3 Information

As already mentioned, inventions are sometimes not reported because they are not recognized as such, or because employees are not aware of the importance to get the inventions protected. Therefore, sufficient information about intellectual property matters is essential for the encouragement of inventiveness.

It is especially important to communicate the necessary information to those members of R & D departments, who have joined the company only recently coming from university. At least in Germany, physicists and engineers usually do not hear anything about intellectual property or patents during their university years. Patent attorneys of the Patent Department make special presentations to groups of those employees during working hours.

Members of the Patent Department also offer study courses of two or six hours within Company or Group educational or training programs to be voluntarily attended by employees after working hours.

Through a recent redesign of the basic Siemens Management Seminar curriculum we have the possibility to make presentations on patent strategies and the importance of intellectual property to the future members of Siemens Upper Management by senior members of our department. Senior members of the Patent Department also use every opportunity to give internal lectures on intellectual property matters and to publish papers on the importance of inventions and patent protection in the internal gazettes of the different Siemens Groups. For several Groups information brochures and pamphlets on intellectual property matters have been designed and distributed to the employees. At present two companywide brochures are in preparation. The one intended for prospective inventors will contain basic information on intellectual property matters in an attractive, easily readable form.

The other, intended for decision-makers will, on a higher level, concentrate on explaining the criteria of patent policies.

Patent documentation as a source of technological information will be the subject matter of other presentations at this Symposium. Therefore, it will be sufficient just to mention that also in Siemens we consider technical information to be an important means for the encouragement of inventiveness. Continuous information of R & D employees about patents of competitors is not only necessary to prevent them from "inventing" things already invented. Such information is also indispensable to initiate new, further-reaching ideas and may contribute to give still unexperienced inventors a better feeling, whether the results of their own work contain patentable matter.

III.4 Cooperation

Cooperation between inventors and the Patent Department as a prerequisite to encourage inventiveness is to be considered now as the last aspect. Nevertheless, I think that a good cooperation between inventors and patent attorneys may be the most important means to promote inventiveness and to give inventors the feeling that the company represented by the patent attorney is interested in protecting the results of their work.

We therefore encourage our patent attorneys to establish and keep contact with the inventors and the R & D department as close as possible.

We try to facilitate the cooperation by an appropriate organization of our Patent Department, and also by proper selection of the sites of the Department's offices. The Patent Department of Siemens AG is subdivided into 10 subdepartments, each consisting of between eight and 27 patent attorneys, the respective subdepartment head included. The head of each subdepartment together with his patent attorneys is responsible for the patent operations of up to three Groups or Corporate Divisions of Siemens AG. Therefore, the top management of each Group or Division has a responsible partner in the Patent Department, namely the head of the respective subdepartment. In a similar way each patent attorney is assigned to take care of all patent matters of one or more organizational subunits of the Group or Corporate Division his subdepartment is responsible for. That means that a certain patent attorney in our Patent Department is primarily not responsible for a certain technology, but for a certain group of people. We do not want our inventors to be confronted with an anonymous patent department. Ideally every prospective inventor should know "his" patent attorney.

We also have selected the sites of the Patent Department's offices in Germany so that these offices are close to major R & D centers or that at least more important development departments can be visited by our patent attorneys by a one day's journey. We consider three patent attorneys as the minimum number for a branch office in Germany, because smaller offices cannot be economically run. At present, we have offices in five German cities.

An ideal cooperation would be established if the patent attorney were fully informed about the R & D work going on in the departments he is responsible for, and if he out of that knowledge were able to give advice to the employees, which results of their work are patentable and should be protected in the interest of the company, thereby triggering the invention

disclosures. In reality this ideal will never be reached, but at least to come near to it should be a permanent aim.

Good cooperation between inventors and the Patent Department further requires that invention disclosures are made as easy as possible for the inventors. Siemens, like many other companies, has developed internal forms guiding the inventor in fulfilling the necessary and essential requirements for an invention disclosure.

Also the proper and timely handling of all legal obligations and especially of inventors' compensation or awards systems is a high priority prerequisite not to discourage inventiveness.

Sometimes it is unavoidable that well-established contacts between an R & D department and the responsible patent attorney loosen, usually because of a temporarily too high workload of the patent attorney. It is our experience that if such conditions last too long, the number of invention disclosures coming from that department will decrease. A decrease of invention disclosures usually is also the result, when the average time between invention disclosures and filing the patent applications becomes too long.

IV. CONCLUSION

As mentioned initially, the aim of my presentation has been to give you an account of the experiences we had within the Siemens Patent Department concerning the encouragement of inventiveness within the Siemens Group. The question remains how far these experiences can be generalized and be useful also for enterprises working in a different economic and cultural environment.

It is my opinion that a corporate culture favorable to inventiveness, clear rules regulating the mutual obligations of employees and employers, sufficient information of employees on intellectual property matters, and close and efficient cooperation between inventors and the patent department or, if there is not a patent department, with an outside patent attorney, are basic prerequisites for the encouragement of inventiveness in an enterprise also under different economic and cultural conditions.

But I would not say the same with respect to the specific regulations concerning the mutual obligations of employees and employers, whether in Germany or in other countries, and of any specific inventors' compensation or awards system. The specific regulations concerning rights and compensations established by law or contract in a certain country are always a part and a consequence of the general employment conditions of that country. Therefore, they cannot simply be considered separately from these conditions. Similar considerations apply to incentive and awards systems. Whether a certain system will be advisable and efficient in a certain country may strongly depend on the value system of the country's people and society.

Therefore, the experience of a German, although worldwide operating, enterprise can only be useful as an example for further consideration but not as a recipe for immediate adoption.

TOPIC 3

THE ROLE OF RESEARCH AND DEVELOPMENT INSTITUTIONS IN THE PROMOTION OF INVENTIVE AND INNOVATIVE ACTIVITY

by

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1. INTRODUCTION

Today, science and technology are making great advances. With the progress of informationalization, the social structure is being transformed, and products of new technology are bringing about a great change in consumers' daily life. The range of scientific and technological influence has become deeper and broader, not limited only to a specific industrial field, as can be seen in the field of new industries that have been developed by new science and technology. Moreover, many hopes are placed on the great potential of science and technology as a key to solve common problems of mankind. From the 90s through the 21st century, the tasks in opening up a new field in resources and energy, food, space and marine resources that human society must wrestle with together, will be brought to the fore while economic and social globalization and interdependence advance. The role to be played by science and technology in solving these problems is extremely important.

Japan has grown up to be one of the economic powers in international society, and its international competitiveness in high-tech industries as well as the level of research and development (R & D) both in their application and development are highly regarded in the world. Japan's technological level has now attained the top level. In particular, it has an outstanding production technology by which superior quality and highly reliable products are supplied. It has also a remarkable product development technology to market products that meet users' needs. In these circumstances, the world is taking much interest in Japanese scientific and technological activities.

The world shows such interest in various forms, such as through criticism or calling for cooperation. One reason for criticism is due to the "free ride of technology"--the fact that Japan has taken basic technology from developed countries and succeeded in marketing it by developing and applying it. It is true that Japan has tried hard in developing application technology and secured its economic growth during its postwar rehabilitation and developing period; however, it is also plain truth that developing a given seed of technology to achieve marketing it after adding value to it requires as much creativity as developing basic technology, or more as the case may be.

For instance, the automobile was invented by Europeans. Henry Ford, an American, brought it to everybody's use by establishing mass-production technology. His achievement won him an established reputation as a man of creativity. On the other hand, it was an American corporation which invented

the video tape recorder and marketed it first in the world. However, it was a device intended for broadcasting and it could not be sold for home use, since its price was prohibitive, in addition to its being complicated to use. It was a Japanese manufacturer who, with the thought of making it available to every home by cutting its price substantially and facilitating its way of operation, took on the R & D and succeeded. Success of such a Japanese electronics manufacturer can be regarded as creative as in the case of Henry Ford.

Today, scientific study and technology development are aiming at the same object, and basic and application R & D are evolving in perfect harmony. The time lag between a scientific discovery or invention and its technological application is reducing (approaching phenomenon). Moreover, a scientific discovery gives rise to a new technology development, and the progress of that technology development creates a condition permitting a new scientific study (resonance phenomenon). These approaching and resonance phenomena between science and technology are making the use of a model of technological innovation--technological innovation follows the process directly from basic study of scientific knowledge to designing and manufacturing through application and development studies--more difficult than ever. For instance, making improvement in the stages of designing and manufacturing requires a feedback process, in which not only restudying the phases of application, research and development, but also tracing back to the stage of basic study is now a matter of great importance to a given further study into basic research in the field of R & D of industrial technology.

Being among the top runners in many fields of science and technology, and in the situation where the above-mentioned approaching and resonance phenomena have become actuality, Japan must now show its creativity more than ever before, while giving priority to basic R & D.

Hereunder, examination is made as to what role industrial, academic and government R & D institutions have played in promoting Japanese R & D activities, and what role is expected of them in the future.

2. ACTUAL STATE OF R & D ACTIVITIES IN JAPAN

Research and development expenditure invested in Japan amounted to Y12,100 billion in fiscal 1990, a substantial increase of 11% from the previous year. In comparison with other countries, the amount represents half the amount spent in the United States of America and equals the total of three countries, Germany, France and the United Kingdom. The ratio of total research expenditure to GNP is 2.77% (1990). This figure is a little below the rate of Germany, 2.89% (1989), and a little over the rate of the United States, 2.74% (1990). The figure for France is 2.33% (1989) and for the United Kingdom, 2.25% (1989); the level of both countries is lower than the Japanese ratio of spending to GNP.

The proportion of research expenditure spent by government (central and local) for the year 1990 is 16.5% and by the private sector 83.5%. Looking at the figures for the fiscal year 1980, government spending accounted for 25.8% and the private sector for 74.1%. This clearly shows that the ratio of private sector spending has increased after entering into the 80s. This can be attributed to the fact that private industries have positively pushed

forward the R & D activities as a part of their economic activities, while the government could not manage to increase R & D expenditure owing to fiscal difficulties. In fact, Japanese private corporations have increased their research expenses thrice as much in the decade from 1981 to 1990. Comparing the proportion of Japanese government spending with other nations, it is considerably lower than that of the United Kingdom (about 40%) and Germany (about 30%), to say nothing of 50% of both the United States and France. In Japan, not only the government spending itself shows a lower rate than those spent in other countries as shown above, the amount flowing into private sector in the form of research aid or commissions is also much smaller in comparison with other countries. Another characteristic of Japan's budget set aside for science and technology is that it is intended for civilian purposes, as in Germany, rather than for defense purposes.

Classifying research expenditure by nature into basic study, application research and development research (see note below) and examining respective distribution ratios, Japan's expenditure for basic study for fiscal 1990 accounted for 12.6%, application research for 24.2%, and development research for 63.2%. Although its expenditure for basic study and development has increased from Y700 billion in 1981 to Y1,500 billion in 1990, an increase of twofold and over spendings for other fields, application research and development research also had a large increase, the distribution ratio thus becoming as stated above.

Note:

Basic study

The term applies to a theoretical or experimental study pursued for the purpose of building up a hypothesis or a theory, or of gaining new knowledge of phenomena or of observable facts, without considering its special application or purpose for use.

Application research

This means research on a specific subject to ascertain its feasiblity, using the knowledge gained from basic study, or research probing in a new method of application with regard to the method already put to practical use.

Development research

This research concerns the utilization of knowledge gained from basic study, application research and actual experience, and is aiming at the introduction of new materials, equipment, products, system and process, or improvement of existing ones.

Percentage of each field of R & D activities, i.e. basic, application and development, undertaken by research institutions shows as follows. In basic study, universities constitute the largest percentage, a little under 50%, corporations a little under 40%, and the rest, other research institutions. In the field of application research, corporations account for about two thirds. In development research, again corporations account for close to 90%. It shows that in Japan the private sector has been taking a greater part in R & D activities, not only in the fields of application and development, but also in the basic study.

3. THE ROLE OF R & D INSTITUTIONS WITH REGARD TO THE PROMOTION OF R & D

As seen in section 2, the private sector plays an important role in R & D activities in Japan, and its investment in R & D, particularly that of manufacturers, has been rapidly increasing in recent years. The ratio of R & D investment to sales, and that to plant and equipment investment also show a yearly increase. The private sector tends to cover a wider part of R & D in the fields close to the market, such as application and development. Its researchers are kept sufficiently informed by flexible in-house management and supported by a flexible personnel rotation system, thus realizing an organic feedback between the market and laboratories. The word "competition," the source of economic force of Japanese corporations, basically applies to the environment of R & D conducted by corporations, as they have also developed a hot competition among themselves in R & D activities. Such factors have contributed to Japan's good performance in the fields of application and development, as stated in section 1.

Corporations which have been carrying forward diversification, new ventures, or enhancement of products in recent years are finding the necessity to return to basic study from the viewpoint of developing a creative technology or of promoting research in the fields of application and development. There is a strong movement afoot to promote basic study among leading corporations, for instance, they are allotting a certain portion of R & D expenses to basic study. As a result, corporations are taking a larger part in basic study also, as stated in section 2.

Since national research institutions can dedicate themselves to long-term research without being swayed by economic performance like the private sector, they have so far pursued basic studies outside the market mechanism, and formed a base for supplying seed for new technology. They have also played the role of a base for exchanging researches within and out of the country. Universities have also pursued basic studies while offering instruction and training researchers (talent training). It is a matter of importance to secure capable researchers both in quality and in quantity, in order to positively proceed with R & D in the field of science and technology. In this sense, it is equally or more important for universities to train capable men rather than to conduct their own R & D activities. This is the very role they should play in promoting R & D activities.

Today, there are loud cries for the need of introducing the theory of competition in R & D activities conducted by national research institutions and universities, and of giving a proper incentive to reseachers. It is therefore necessary to ameliorate the conditions of researchers, so that those achieving creditable results or those having such potentialities can participate in the "competition" for proper treatments both in research budget and pay.

Approaching and resonance phenomena between science and technology signify that it is now indispensable to grasp science from a technological viewpoint, or technology from a scientific viewpoint, as proved by some cases where new scientific knowledge was required to develop high technology, or new scientific knowledge was obtained in the process of developing high technology. As stated above, basic R & D that Japan must attach importance to lies in the domain where science and technology are deeply correlated. This sort of R & D is required also for the purpose of maintaining our production technology and the potential of application and development researches.

In promoting such basic R & D, it is basically important for the private sector, universities and national research institutions to improve their own research function in this field so as to obtain results highly valued in the world. At the same time, it is essential to have closer ties between and among industry, universities and national laboratories, showing distinctive characteristics of each institution according to the object and substance of R & D. In addition, this sort of basic R & D requires a relatively long period of time. Today, when economic and social changes are taking place at an accelerated pace, it may well be that the importance of R & D requiring a long term will be underrated owing to a change of environment, on which the R & D was initially based. For this reason, it becomes necessary, when pursuing R & D that requires a long period of time, to divide the period of research into two to three phases and evaluate it at midterm to see whether to proceed to the next phase or not. It is also important to review the object of research timely and properly in the light of economic and social changes.

4. EXPERIENCE OF INDUSTRIAL-ACADEMIC-GOVERNMENTAL TIE-UP UNDER THE R & D PROGRAM ON BASIC TECHNOLOGIES FOR FUTURE INDUSTRIES

In considering the direction to push forward creative and basic R & D to which Japan should attach importance, the way adopted by the Ministry of International Trade and Industry (MITI) in proceeding with the R & D Program on Basic Technologies for Future Industries (hereinafter referred to as "JISEDAI Program") for the last 10 years may be instructive. Under the catch phrase of "from 'rearing buds' (rearing a seed of technology) to 'a sapling' (examination of the possibility of putting it to practical use)" the program has as its objective establishing the next generation industries and developing innovative technology indispensable for improving a wide range of existing industries; at present, R & D on 11 themes is carried out in five fields: superconductivity, new materials, biotechnology, new electron devices, and software.

The program is carried out by industry (corporations), academia (universities) and government (national research institutions) in close cooperation. In order to make use of the potential of the industrial world, R & D is commissioned to the private sector, while national research institutions themselves are also pursuing R & D. The academic world lends its cooperation to R & D mainly in planning a project and its evaluation. In addition, universities are commissioned to do research in basic study subject. For the purpose of introducing the mechanism of competition within each research institution, a "parallel development system" has been adopted, under which R & D is, in principle, conducted by plural research institutions with plural methods. Moreover, a basic plan for R & D was formed, and its orderly enforcement was designed by dividing that 10-year plan into two to three terms, setting a certain target at each stage and examining situations and results of R & D in comparison with the set target.

Now entering its 10th year, the JISEDAI Program has produced excellent results and become a pilot precedent for creative and basic R & D.

5. FUTURE DIRECTION OF PROMOTING R & D ACTIVITIES IN JAPAN

The tasks assigned to science and technology towards the 21st century are colossal.

The first task is to solve many problems that we are now faced with, such as preservation of the earth's environment, issues of energy and food, so that peoples of the world can coexist in peace and harmony with the earth. The second is to increase the intellectual stock, that is international public property. It is of course important to make efficient use of the intellectual stock accumulated by mankind through many years, but it is more important to further augment the intellectual stock by pursuing basic R & D on subjects such as substance, information, life, space, ocean and the earth. The third task is to build up a rich society where people can live with a sense of security by promoting health, improving living environment and social infrastructure, preventing disasters and maintaining safety.

In order to promote creative and basic R & D to meet these tasks, it is important for industrial, academic and governmental research institutions to actively complete one another and work hard together. At the same time, they are required to cooperate with each other as the occasion demands. In Japan, the most urgent and important issue is to improve and perfect outworn and out-of-date facilities of national research institutions and universities, whose research funds are lower than in the private sector. Without such improvement, open competition and cooperation among industrial, academic and governmental research institutions will not hold good, and no favorable results can be expected in creative and basic R & D.

When mapping out the future course of R & D, what counts for much is a way of looking at it with "techno-globalism from a global viewpoint." Japan is regarding the idea of techno-globalism as follows: "With the object of maximizing internationally the benefits accruing to mankind from science and technology, all nations are to make efforts in cooperation in order to activate creative activities of science and technology, their circulation and transfer"; and it is proposing a human frontier science program as an international joint research, as well as pushing forward its concrete measures by means of, for instance, transferring science and technology to the developing countries.

In order to give vigor to the above-mentioned activities of science and technology, we believe that it is important to establish many centers of excellence in the process of competition and cooperation among industrial, academic and governmental research institutions. In a general sense, a center of excellence is a research institution that has built up a tradition of its own by maintaining an excellent research environment and achieving excellent results, by means of establishing a system of flexible research work, its strict estimation, arrangement of competitive research environment, opening doors to international society, and free access for domestic and foreign researchers. A research institution aiming at being a center of excellence must direct its efforts to building up such tradition. Although it is impossible to foster it as a matter of policy, it is possible to better the conditions that can give an incentive to "efforts."

We look forward to a time in the near future when Japan can contribute more to the world economy through creative and basic R & D activities that will be pursued actively at many centers of excellence to be established in Japan.

THE ROLE OF RESEARCH AND DEVELOPMENT INSTITUTIONS IN THE PROMOTION OF INVENTIVE AND INNOVATIVE ACTIVITY

by

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It is a great pleasure to have this opportunity to attend the WIPO Asian Regional Symposium on the Promotion of Invention and Innovation which is cosponsored by WIPO, the Government of India and the Japanese Patent Office. Today I will present the Republic of Korea's experience with regard to the role of R & D institutions in the promotion of inventive and innovative activity.

1. INTRODUCTION

In the early stage of industrial and technological development in the Republic of Korea, private firms carried out little R & D activities and relied heavily on imitation of foreign technology. However, government-sponsored R & D institutes did do limited original R & D work which played a key role in laying the foundation for the infrastructure of the country's R & D systems and developing new technology. Furthermore, these government-sponsored institutes served as effective means of implementing the government policy of promoting science and technology development.

Recent changes in the economic and social requirements in the Republic of Korea, however, have raised several essential issues for our national R & D effort and overall management. Technology protectionism and market-opening pressure from developed countries have created a deeper awareness of the importance of R & D.

Furthermore, labor strikes of recent years have encouraged companies to accelerate technology development in order to increase productivity. Private firms have begun to seriously consider cost reduction through automation and production of higher quality products. This can only be achieved by expanding inventive and innovative activities. The government has begun to place a higher priority on high technology projects.

The Republic of Korea's current national R & D system and the division of research roles among government-sponsored R & D institutes, private research institutes and universities have also become issues of great concern to government policymakers.

This presentation will cover three major areas: resources for R & D institutes, creation of government-sponsored institutes and their role, and realignment of the functions of R & D institutions.

2. RESOURCES FOR R & D INSTITUTES

(1) R & D Investment

The Republic of Korea's total investment in science and technology (S & T) grew from 0.86% of GNP in 1980 to 2.24% in 1990, and amounted to 3,767 billion Won. This achievement is due largely to the average annual increase of over 14% of the science and technology budget and massive increase of over 60% per annum by the private sector. Table 1 shows that the share of the private sector exceeds that of the government after the mid 1980s, reaching a level over 70% from 1985.

The rate of increase in R & D expenditure has remained at 31% during the 1980s as shown in Table 1.

But these investment ratios are far lower than planned and those of advanced countries.

TABLE 1

INVESTMENT AND R & D EXPENDITURE

(Unit: billion Won, %)

	'82	'85	'87	'88	'89	'90
S & T Investment	555.0	1,286.2	2,062.9	2,593.7	3,019.9	3,767.4
Rate of Increase	37.3	34.8	23.8	25.7	16.4	24.7
Gov't Portion	52	28	28	26	26	28
R & D Expenditure	457.7	1,155.2	1,878.0	2,347.4	2,705.1	3,210.5
Rate of Increase	56.2	38.5	23.3	25.0	15.2	21.5

Source: S & T Annual Report.

(2) R & D Institutes in Private Firms

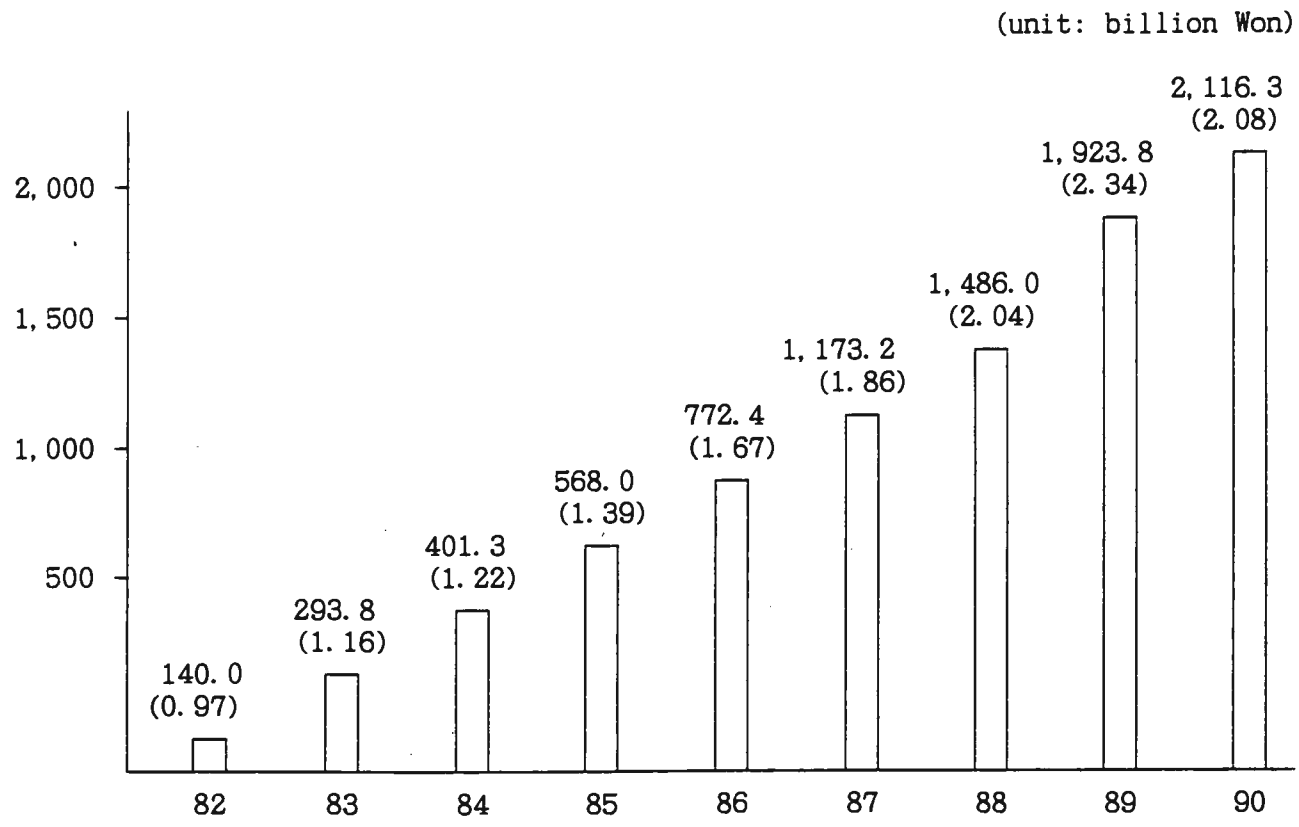
The number of private R & D institutes jumped to 1,000 by April 1991, up from 53 in 1981. In the early 1980s, R & D organizations were set up by big firms but from the later part of the 1980s more small and medium-sized firms began setting up R & D institutes. This was due, in large part, to the government's promotion policy of providing financial and tax incentives and so forth.

In 1990 private firms invested about 2.1 billion Won in technology development as shown in Figure 1. This accounts for 70% of total national investment in technology development.

More than 31,000 researchers worked in private institutes in 1990, but only 5% of these researchers had doctorate degrees, which is much lower compared to the level of PhD holders at university institutes.

FIGURE 1

INVESTMENT IN TECHNOLOGY DEVELOPMENT BY PRIVATE FIRMS



Note: ( ) ratio of technology investment to sales.

(3) Public R & D Institutes and Government-Sponsored R & D Institutes

There are 12 R & D institutes operated by government-funded enterprises, which spent 179 billion Won on their R & D activities in 1989, and 84 government-run R & D institutes which have combined government funding of 104 billion Won. The number of researchers in these institutes totaled 6,201 persons. As for the government-sponsored research institutes, 21 institutes are involved mainly in national R & D projects and contract research projects. In 1991 these institutes employed 10,337 personnel including 859 administrative support personnel and had total expenses of 471 billion Won of which 217 billion Won were covered by the government budget.

(4) R & D Activities in Universities

While R & D activities in universities have not been active, the primary role of universities in the development of technology is supplying highly educated manpower. As shown in Table 2, among 16,229 doctorate degree personnel in the R & D institutes, almost 80% of the total worked in universities. As the statistics show, the number of students per professor is 50 and research expenses per professor are 11 million Won. The R & D resources for university professors are not substantial compared to the situation at other institutes.

TABLE 2

NUMBER OF RESEARCHERS BY DEGREE

(Unit: person, %)

	Total	Universities	Research Inst.	Enterprises
Total	66,200 (100)	20,849 (31)	10,204 (16)	35,167 (53)
D. Sc.	16,229 (100)	12,768 (79)	2,534 (15)	927 (6)
M. Sc.	19,520 (100)	6,967 (36)	4,729 (24)	7,824 (40)
B. Sc.	28,953 (100)	1,051 (4)	2,570 (9)	25,332 (87)
Etc.	1,518 (100)	63 (4)	371 (24)	1,084 (72)

Source: S & T White Paper (1991).

3. CREATION OF GOVERNMENT-SPONSORED R & D INSTITUTES AND THEIR ROLE

(1) Birth of KIST and KAIST

The Government of the Republic of Korea has mobilized many policy instruments over the past two decades for the industrialization of the Korean economy. As early as 1962, when the First Five-Year Economic Development Plan was launched, science policy was emphasized in order to effectively meet the technological requirements of the planned industrialization and economic modernization. Many of the implicit instruments were embodied in industrial policy, while major explicit policies came after the Second Five-Year Development Plan.

The rapid progress of industrialization forced Korean industry to increase its R & D efforts. Consequently, the Korea Institute of Science and Technology (KIST) was established in 1966 in order to meet the growing demand from industry.

KIST, the first modern multidisciplinary industrial research organization in the Republic of Korea, was founded through a special law to undertake contract research projects with private companies for their active

participation. The spectrum of its activities was broad, ranging from project feasibility studies and technical services to engineering studies on a pilot plant scale and more serious R & D. At the early stage of the Republic of Korea's industrialization, the R & D activities of KIST were naturally directed toward the solution of simple problems in the field arising from the process of technology transfer. In the 1970s, however, the demands became more sophisticated as better technologies were needed to enhance productivity, to increase the local contents such as raw materials, and to improve technologies imported from abroad.

With visible progress on the part of industry in the 1980s, industrial contracts diminished considerably, and KIST began to assume a different role by undertaking projects of national interest which were characterized by high risk, externality, and a long gestation period. It was in 1981 that KIST was merged with the Korea Advanced Institute of Science (KAIS) to become what is now known as the Korea Advanced Institute of Science and Technology (KAIST).

KAIS was established in 1971 with the recognition of increasing needs for highly trained manpower. When KAIS was established it was a new mission-oriented postgraduate school to complement existing universities and colleges, producing high-level scientists and engineers needed for the Republic of Korea's fast growing industry. At the same time, KAIS undertook research projects of interest to Korean companies so that the students could experience practical problems in the course of their education. Every year several hundreds graduated from KAIS with master, engineering, and doctorate degrees.

(2) Other Government-Sponsored R & D Institutes

The Korea Scientific and Technical Information Center (KORSTIC), founded in 1962, was restructured in 1972. It played the role of an information clearinghouse by collecting, processing, and disseminating scientific, technical and patent information systematically for international transfer of technology to both industry and research organizations. KORSTIC was later merged with the Korea International Economics Institute to become KIET. KIET, in turn, was restructured with expanded functions in 1991, and became the Korea Institute of Industry and Technology Information (KINITI).

The continued expansion of the Korean economy, with the increasing sophistication and diversity of its industries, required newer and more sophisticated technologies in a wider range of areas. KIST alone was not able to meet this growing demand. For this reason there have been spin-offs from KIST to establish a number of "satellite institutes," each designed to specialize in an area of high industrial priority: shipbuilding, marine resources, electronics, telecommunications, energy conservation, machinery and metals, chemicals, and standard research. These specialized institutes handle research projects which KIST undertook previously.

These institutes are developing the capabilities to enable them to effectively serve as the central sources of expertise in their respective fields. These public sector institutes then induced a third wave of the diffusion process in private companies to establish their own R & D institutes in the 1980s.

Daeduk Science Town was developed in the late 1970s to accommodate most of these institutes together with central laboratories of private

enterprises. The institutional framework cannot be complete without organizations to support basic research of academia and technology development of the private sector. The Korea Science and Engineering Foundation was established in 1977 as a funding agency to support university professors' basic and applied research. As a venture capital organization, the Korea Technology Development Corporation was created in 1981 to foster technology-based firms. A few more venture capital firms have followed, some completely privately owned.

(3) Promotion of Private Research Institutes

In order to promote technological development in the industrial sector, the government encouraged large companies to establish one research center in each company while small and medium companies were advised to organize joint research facilities for their specific fields of technology.

The same tax incentives and government funding included in the Technology Development Promotion Act, which were extended to government-sponsored research institutes, were extended to private research institutes in order to carry out joint national projects. Consequently, as of the end of 1991, more than 1,000 private research institutes were established. This includes several research institutes which were established in foreign countries.

There are 58 research consortia which not only handle the research activities for small and medium enterprises, but also handle joint projects in large-scale high-technology areas. About 1,181 firms participated in these consortia. To date the basic function of the consortia has been R & D for upgrading the level of technology, coordinated import of foreign technology, technical guidance for members and R & D for assimilation of imported technology.

4. REALIGNMENT OF THE ROLE OF R & D INSTITUTIONS

(1) Environmental Change

Since the 1970s, large-scale investment projects have been undertaken in the steel, shipbuilding, petrochemical and machinery industries in order to further develop the industrial structure. In this process government-sponsored R & D institutes participated actively with the industry or in government-sponsored development projects which contributed to the Korean industrialization. As a result, the share of manufacturing value added by the heavy and chemical industries increased.

On the other hand, the technology protectionism of developed countries has affected governmental science and technology strategies to enhance technology development. Since the 1980s, technology transfer has become more difficult. The Government of the Republic of Korea has pursued a technology-driven strategy and put emphasis on high-technology development in such areas as new materials, precision chemicals, mechatronics, biotechnology and systems industry. To be more specific these new areas include high temperature super-conducting materials, HDTV (high definition television), 64 MDRAM, magnetic levitation trains, CIM (computer integrated manufacturing) technology, and are part of national R & D projects.

As a result of the promotion of R & D capability at the private sector level industries are better able to meet their R & D demands. They have also placed emphasis on collaborative research with government-sponsored R & D institutes. The government has begun to place more emphasis on the development of social welfare technology (such as environmental technology), high technology (such as HDTV) and large-scale projects (such as aircraft).

(2) Role Adjustment Among the Three Sectors of R & D Institutes

The technological and investment capabilities of the private sector have increased dramatically. These phenomena can be regarded as positive signals for national development, but they will require government-sponsored R & D institutes (GRI) to change and adjust their role in the national R & D system.

Investment in science and technology came mostly from the government until 1977, but the situation has changed since 1982. Although the role of government, like that of GRIs, was dominant until the early 1980s, private industry is becoming more dominant, particularly in commercial technology.

The number of private research institutes increased to more than 1,000 by the end of April 1991. Recent newspaper reports illustrate their R & D results: the indigenous design of an automobile engine by Hyundai Motor Co; gamma interferon; and a fourth-generation antibiotic by Lucky Ltd. It is particularly interesting to see that the commercial production of the Lucky-developed antibiotic will be carried out in three years by Britain-based Glaxo through a licensing agreement.

The Korea Telecommunication Authority, though not completely private, announced its successful testing of a full digital electronic switching system of 100K subscription lines, TDX-10, which is an upgraded version of TDX-1. These examples distinguish themselves from previous achievements which were developed either jointly with, or solely by, the public sector institutes.

Such innovations accomplished by the private initiatives provide a positive sign for the transition of industrial development of the next stage of technology value-added, further supported by the attentive interest of small and medium enterprises in technology.

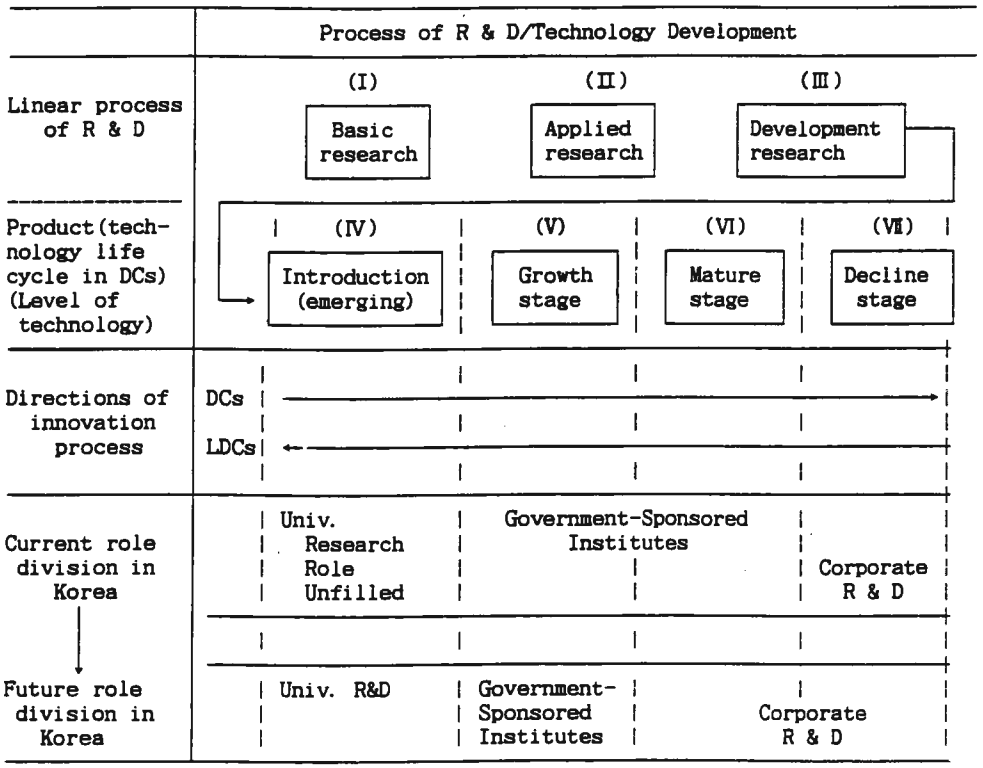
Meanwhile, the government's demand for R & D has increased drastically, while corporate demand for R & D from government-sponsored research institutes has decreased. The public sector's ability to provide R & D reached limitations as private industry has increased its R & D capabilities through the establishment of institutes to meet their own R & D demand. Since its implementation of national R & D programs in 1982, the government has steadily expanded its R & D investment. The government should handle technology development in such areas as high-risk, public welfare and long-term projects with multidisciplinary research requirements. Government-sponsored R & D institutes have to shift their research direction and adapt to government R & D needs.

As a consequence, the private sector research institutes need to form a kind of national R & D system in cooperation with public sector institutes and universities. The national R & D system is beginning to take shape with an effective division of roles among concerned organizations, so the limited available development resources can be used most efficiently.

As shown in Figure 2, the roles of the three sectors are divided as follows: Universities are devoted to education and basic research, and government-sponsored research institutes to the development of welfare-related technology, long-term projects and applied research, with multidisciplinary research requirements, while the corporate institutes are devoted to commercial technology and development research.

FIGURE 2

ROLE DIVISION OF R & D AMONG GRIS, PRIVATE INSTITUTES AND UNIVERSITIES



Source : Performance and Adaptive Role of GRIs

5. R & D PERFORMANCE

In summing up the roles and missions of the various R & D institutes, specifically the government-sponsored R & D institutes, they can be listed as follows: (i) fostering national R & D capabilities via R & D personnel cultivation and R & D system formation, (ii) providing technical support for government policy-making and implementation, (iii) playing the leading role in science and technology development via successful R & D output and assistance for industry, (iv) developing sophishicated industrial technologies strategically chosen through GRI-industry collaboration, (v) serving as a center of international technology cooperation, (vi) contributing to large-scale projects in industries such as defense and space, and (vii) developing technologies for social benefit and social infrastructure. The more industrial development is achieved, the more important the latter role of R & D institutes has become.

The contributions of R & D institutions to technology development can be further categorized into direct and indirect performance. Three measures can be used to evaluate the direct performance: (i) commercialization, (ii) industrial rights, and (iii) royalty contracts. In addition, four surrogate factors could be considered in evaluating the indirect performance: (i) the number of spin-off R & D institutions from the focal institute, (ii) human capital formation, (iii) cost reduction in technology contracts due to enhanced bargaining power, and (iv) support for science and technology policy-making.

I would like, therefore, at this stage to touch upon briefly the situation of commercialization, industrial property rights and technology exports which, I hope, could serve to evaluate the direct performance of R & D activities.

(1) Commercialization

Out of 34,446 ideas put forth by the corporate sector in 1989, 7.3% were commercialized as shown in Table 3. Regarding the commercialization of ideas, small companies have been more successful than big firms. Compared with 6-8% for developed countries, the Korean cases are concentrated mainly on the innovation of parts rather than the result of indigenous R & D.

TABLE 3

RATIO OF COMMERCIALIZATION

(Unit: %)

	No. of Ideas	Selected Ideas	Implementation of R&D	Success of R & D	Commercialization
Total	34,446	61.5	22.3 (36.3)	11.3 (50.6)	7.3 (67.5)
Product	30,931	62.0	20.9 (33.7)	11.0 (52.5)	7.4 (67.2)
Process	3,515	57.5	34.9 (60.7)	14.1 (40.5)	6.5 (45.7)
Big Firm	30,498	62.0	21.2 (34.1)	10.5 (49.9)	7.0 (66.7)
Product	27,696	62.4	19.7 (31.7)	10.3 (52.3)	7.2 (70.0)
Process	2,802	58.9	34.8 (59.1)	12.6 (36.3)	5.1 (40.4)
Small Firm	3,948	57.2	31.8 (59.1)	17.1 (54.5)	9.2 (53.7)
Product	3,235	58.4	30.5 (52.3)	16.5 (53.9)	8.6 (52.3)
Process	713	52.0	35.3 (67.9)	20.1 (56.7)	11.8 (58.7)

However, out of the 1,058 government-funded projects and joint projects between government and private firms from 1982 to 1989, 201 projects were commercialized and 77 were involved in commercialization as shown in Table 4.

TABLE 4

COMMERCIALIZATION OF SPECIAL PROJECTS

(Unit: case, %)

Project	Commercialization			No. of Projects	A/C	(A+B)/C
	final	process	total			
Gov't Project	18	36	54	469	3.8	11.5
Joint Project	183	41	224	589	31.1	38.0
Total	201	77	278	1,058	19.0	26.3

(2) Industrial Property Rights

Of various forms of industrial property, patents are most intensively involved with R & D results. Applications by juridical persons increased by more than 30% from 1988 to 1990 while personal applications did not increase, as shown in Table 5.

More than 1,000 applications were filed with the patent office as a result of special R & D projects designed by the government or jointly with private firms, and 269 patents were registered.

TABLE 5

NATIONAL APPLICATIONS BY TYPE OF APPLICANTS

Year	Applicants	Total	Patents	Utility Models	Industrial Designs	Trademarks
1988	Individual	27,011	1,564	8,726	9,195	7,526
	Juridical Person	41,289	4,132	12,940	7,542	16,675
1989	Individual	28,280	1,592	8,460	9,588	8,640
	Juridical Person	42,823	5,429	12,195	6,921	18,278
1990	Individual	31,904	1,815	9,006	10,073	11,010
	Juridical Person	49,809	7,267	12,655	7,333	22,554

For the effective management of industrial property rights, 664 firms established industrial property departments or sections which are separate from R & D institutes and about 1,822 experts work with these special organizations.

(3) Technology Exports

Since I do not have the data with me on the royalty income of each institute, I would just like to give you the amount of technology exports.

The amount of technology exports has been growing recently. When comparing technology imports with exports, as shown in Table 6, the imbalance between imports and exports is widening, mainly caused by the lack of original and indigenous technology development. This trend will continue by the time the effects of active R & D activities are realized.

TABLE 6

TECHNOLOGY IMPORTS AND EXPORTS

(Unit: million, %)

	1983	1984	1985	1986	1987	1988	1989	1990
Amount of Export	18.9	16.9	11.3	11.7	9.1	8.9	10.5	21.8
Amount of Import	149.5	213.2	295.5	411.0	523.7	676.3	930.3	1,087.0
A/B	12.6	7.9	3.8	2.8	1.7	1.3	1.1	2.0

6. CONCLUSION

I have tried to demonstrate the R & D institutes' ability and role for the promotion of technology in the Republic of Korea. R & D institutes have made great contributions to both the technology development and the promotion of inventive and innovative activities during the last two decades. R & D institutes by sectors changed their roles not only to meet changes in scientific and technical environment but also to utilize their R & D capabilities more effectively.

As the Republic of Korea's level of technology development lies between developed and developing countries, the role of R & D institutes would be more significant in the sense that it simultaneously needs the capability to adapt advanced technology and invent new and original technology.

REFERENCES

J.S. Burgess, "The Evaluation of Government-Sponsored Research and Development Program" (1966)

H.S. Choi, "Science Policy Mechanism and Technology Development Strategy in the Developing Countries (1988)

Toren, N. and D. Galai, "The Determinations of the Potential Effectiveness of Government-Supported Industrial Research Institutes" Research Policy, Vol. 7 (1978)

D.H. Lee, Z.T. Bae and J. Lee, "Performance and Adaptive Roles of the Government-Supported Research Institute in South Korea" World Development, Vol. 19 (1991)

C.O. Lee, "The Role of Government and R & D Infrastructure for Technology Development" (1991)

D.S. Han, "The Outcome of the Technological Development Policy for Development of Korean Economy" (1985)

Ministry of Science and Technology, "A Study on the Management System of the Government-Supported Research Institutes" (1991)

MOST, "Science and Technology Annual Report" (1991)

Korea Industrial Technology Association, "Industrial Technology White Paper" (1991)

Korean Industrial Property Office "Annual Report" (1991)

THE ROLE OF RESEARCH AND DEVELOPMENT INSTITUTIONS IN THE PROMOTION OF INVENTIVE AND INNOVATIVE ACTIVITY

by

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In this presentation an analysis is given of the present situation of the Hungarian R & D, with special emphasis on the new roles and policies of research institutes.

In order to understand the current processes of the R & D sphere, we first have to briefly survey the political-economic changes. These changes in Hungary are clearly reflecting the main lines of the transformations in Central Eastern Europe where former communist countries are to establish market economies.

FIGURE 1

MAJOR POLITICAL CHANGES IN HUNGARY

(1988-1990)

Reform communist government
Prime Minister M. Németh (1988)

Declaration of the Hungarian Republic
(October 23, 1990)

Free elections, coalition government (1990)

I. POLITICAL-ECONOMIC CHANGES IN HUNGARY

As you all know, between 1948 and 1988 a communist regime existed in Hungary. By 1987-88, on one side, the whole Hungarian economy was on the verge of collapsing, and on the other side, due to Gorbachev's line in the Soviet policy, a unique possibility emerged for a bloodless revolution.

A reform-communist government was formed in Hungary by Prime Minister Miklós Németh. This government had the historical role of introducing a major part of the basic legislation needed for the conversion of the political-economic system.

In Hungary this was facilitated to an extent greater than in other Central Eastern European countries as a result of many previous attempts during the communist regime to introduce different elements of the market economy.

On the 34th anniversary of the 1956 Hungarian revolution, the Hungarian Republic was declared.

In the spring of 1990 free democratic elections were held.

Six parties achieved the preset limit for entering Parliament. A party called Hungarian Democratic Forum (MDF) won the elections and a new government was formed, headed by MDF President, Mr. József Antal, in a coalition with two smaller parties and with a reassuring majority in the House.

Since then there has been political stability in Hungary. In the new political system, manifold economic changes were started, sometimes with shock-like impact.

TABLE 1

INDUSTRIAL PRODUCT SALES
(1987-1991, previous year = 100%)

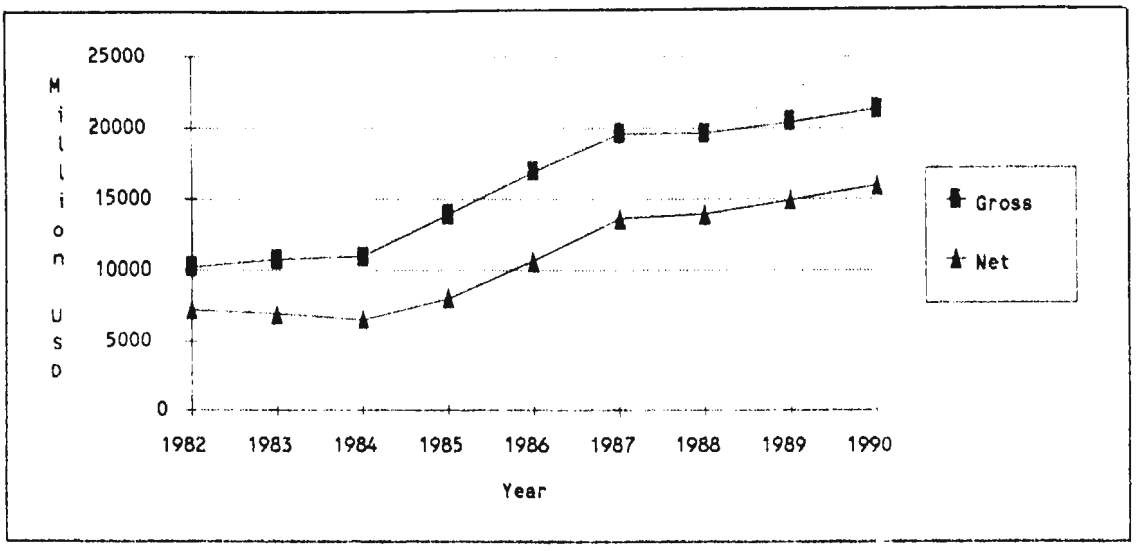
Sector	1987	1988	1989	1990	1991 Jan.-Sept.
Mining	99.60	96.32	94.80	88.20	93.10
Electric energy	104.40	100.10	102.20	100.20	93.00
Metallurgy	100.90	104.30	104.40	81.00	72.40
Machine industry	104.70	100.00	100.20	86.30	68.00
Building material industry	106.90	101.60	98.40	95.00	69.60
Chemical industry	106.10	101.30	96.10	94.60	85.40
Light industry	102.90	100.20	95.20	90.00	77.50
Industry (without food)	103.60	100.10	96.10	89.70	78.40

Source: Ipari Szemle, No. 4 (1991).

In Table 1 you can see the decline of the industrial output in Hungary. The situation is specially critical in the machine, building material, and light industries.

FIGURE 2

GROSS AND NET DEBTS OF HUNGARY
1982-1990, million US$



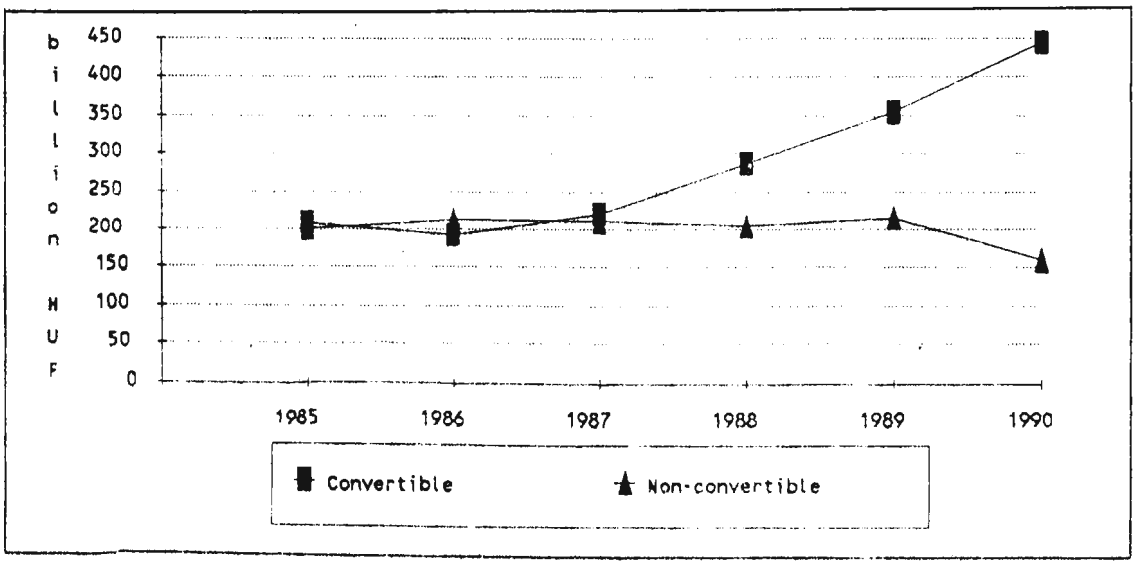
Source: Annual Report of the Hungarian National Bank (1990), p. 60.

During the 1980s the communist governments tried to maintain the level of the standard of living by huge foreign loans.

Figure 2 shows the increase of the gross and net debts of Hungary. The utilization of the loans was not efficient as they mainly covered the losses of the economy only. This process resulted in the highest per capita debt burden among the Central Eastern European countries.

FIGURE 3

HUNGARIAN EXPORT INCOME
1985-1990, billion HUF



Source: Annual Report of the Hungarian National Bank (1990), p. 103.

In the whole situation it was a question of utmost importance to redirect the market orientation of Hungarian products.

Supported by an encouraging government regulatory system, Hungarian enterprises have increased convertible exports at the expense of the nonconvertible sales (Comecon market).

The results seen in Figure 3 certainly mark an important achievement. Official data are available only up to 1990.

Starting from January 1991, Comecon countries began to account their trading in convertible currency. This meant the collapse of the Comecon, and in 1991 total Hungarian exports--although in convertible currency--diminished by about 10-20%. No reliable official figures have been released yet for 1991.

TABLE 2

CONSUMER PRICE INDEX
(previous year = 100%)

1988	1989	1990	1991*
115.5	117.0	128.9	135.0

* Expected.

Source: Yearbook of the Central Office of Statistics (1990), p. 128.

Another sad fact of the Hungarian economy is the rather high rate of inflation. In Table 2 you can see the increase of the consumer price index. In the communist world the majority of prices did not correspond to real values due to a complicated system of government subsidizing. After the gradual diminishing of government subsidizing the consumer price level increased sharply. However, in Hungary inflation seems to be well under control and for the next year even a decrease in the inflation rate is forecast.

Unemployment

Unemployment was unknown in the old times. Presently, by the end of 1991 the number of unemployed persons is approaching 400,000 (8.3% of the work force). It is especially the very fast increase which causes problems. In January 1990 the number of unemployed persons was only 1/20th of the present one.

Privatization

As you all know the basic difference between communist and market economies lies in the proprietary rights. Earlier in the communist years two forms of ownership were dominant: State property was characteristic for industry, a large part of agriculture and services; cooperative property was characteristic for agriculture and consumer services. The private sector was insignificant.

In the Central Eastern European region nowadays everybody agrees on setting privatization as the number one task in the transformation of the economy. Nevertheless there are heated discussions about the ways of reaching this goal.

Privatization in Hungary can be traced in the increase in the number of companies, as can be seen in Table 3.

TABLE 3

NUMBER OF PROFIT-ORIENTED ORGANIZATIONS

Type	1988	1989	1990	1991
	December 31			June 30
Companies	2,377	2,399	2,363	2,362
Business assoc.	954	5,224	19,401	32,238
From this:				
Limited liabitity companies	451	4,485	18,317	30,949
Companies limited by shares	115	307	646	868
Cooperatives	7,414	7,546	7,641	7,438
Total	10,745	15,169	29,405	42,338

Source: Ipari szemle, No. 2 (1991).

In the middle of 1991, the number of companies was four times higher than in 1988. It is quite natural that, due to the lack of investment capital, at first mostly small companies were formed, particularly in the consumer service area. In this situation, it is more than desirable to invite foreign capital to invest in Hungary.

TABLE 4

FOREIGN OPERATING CAPITAL INVESTED
(in million US$)

1986	1987	1988	1989	1990	1991*
7.0	8.0	23.0	215.0	569.0	771.0

* Expected.

Source: Annual Report of the Hungarian National Bank (1990), p. 110.

Table 4 shows the foreign operating capital invested in Hungary until now. According to international statistics, more than half of the foreign investments in the whole region have come to Hungary so far--more than $1.5 billion.

TABLE 5

COMPANIES WITH FOREIGN INVESTMENTS (1990)

Sector	Number	Capital asset million HUF	Foreign part (%)
Industry	1,322	103,839	27.8
Building industry	457	6,772	33.6
Agriculture	63	5,407	7.6
Transport	119	6,463	5.5
Trade	2,240	52,416	28.0
Others	970	21,127	40.4
Total	5,171	196,024	28.1

Source: Annual Report of the Hungarian National Bank (1990), p. 36.

It is interesting to analyze the distribution of foreign capital according to the different sectors it was invested in.

In Table 5 you can see that in companies with foreign investment the average foreign participation is 28.1%.

The most preferred areas are industry, the building industry, commerce and various other fields of the Hungarian consumer sector. Some relatively large multinational investments--for example, General Electric, Suzuki, Opel--are particularly important for the country.

II. RESEARCH AND DEVELOPMENT IN HUNGARY

(1) Financial Resources

In many respects the R & D potential of Hungary occupied a more favorable place than would be expected on the basis of its economic output. The proportion of R & D expenses to GDP, as well as the number of employees in the sector per 10,000 inhabitants exceeded those of many small countries in Europe. The network is wide-ranging and a large number of people hold scientific degrees.

However, the network is poorly equipped and its efficiency is insufficient. In 1990 total R & D expenditure in Hungary amounted to 33.7 billion Hungarian forints, about $533 million. This corresponds to 1.69% of GDP.

TABLE 6

HUNGARIAN R & D EXPENDITURE
PERCENTAGE OF GDP

Year	%
1981	2.49
1982	2.54
1983	2.30
1984	2.35
1985	2.36
1986	2.55
1987	2.65
1988	2.32
1989	2.02
1990	1.69

Source: Manuscript OMFB 18-9101-Et (1991), p. 16.

Table 6 shows the steadily decreasing ratio of GDP spent on R & D.

TABLE 7

INTERNATIONAL R & D EXPENDITURE
PERCENTAGE OF GDP (1990)

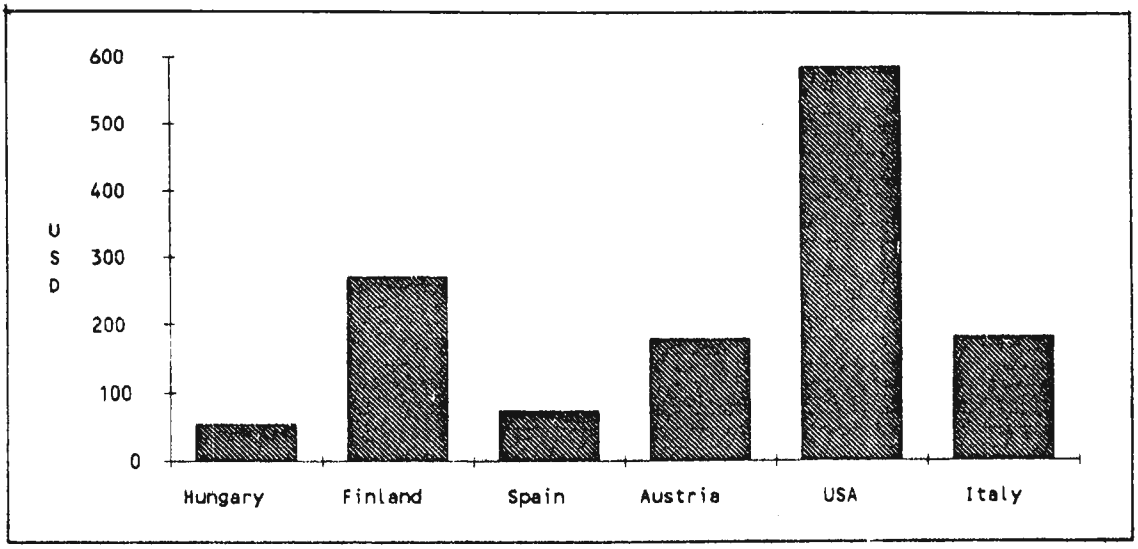
Country	%
Austria	1.36
USA	2.78
Germany	2.84
France	2.38
Italy	1.29
Canada	1.33
Hungary	1.69

Source: Manuscript OMFB 18-9101-Et (1991), p. 16.

In international comparisons even the 1.69% exceeds the corresponding values of many countries; some examples are given in Table 7. However, if we consider the rather modest value of the Hungarian GDP, it is better to calculate the per capita R & D spending as it can be seen in Figure 4, below.

FIGURE 4

INTERNATIONAL COMPARISON IN
PER CAPITA R & D EXPENDITURE (1990)

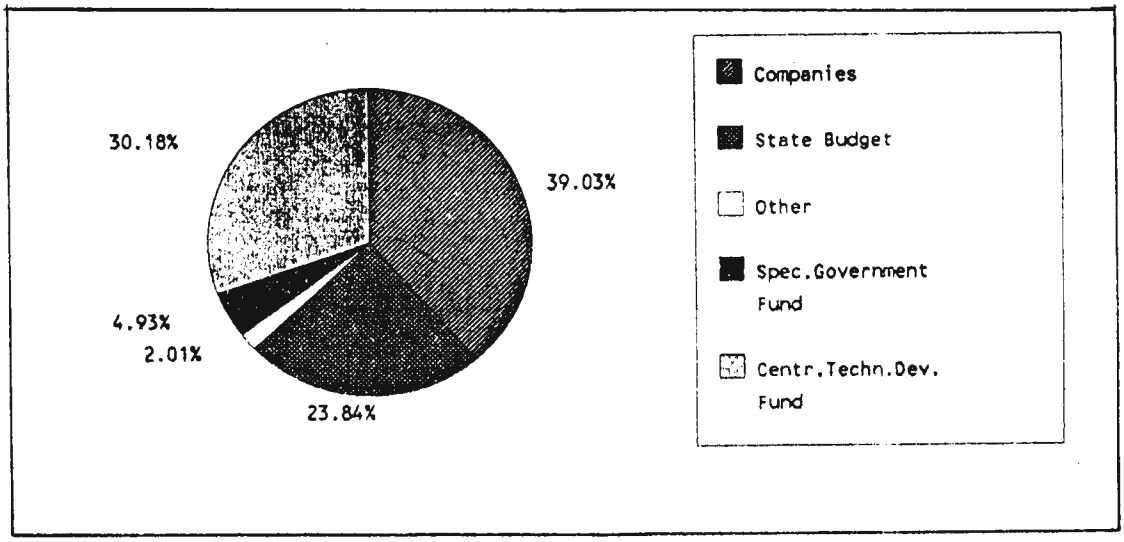


Source: Manuscript, OMFB 18-9101-Et (1991), p. 19.

In 1990 this value was only $54.

FIGURE 5

SOURCES OF R & D EXPENDITURE (1990)



Source: Special Report on Scientific Research and Experimental Development in 1990, Central Office of Statistics (1991), p. 13.

Figure 5 shows the financial sources of R & D in 1990. Roughly one quarter of the expenditure was covered by the State budget and the rest by companies. One third of the companies' contribution was centralized as a Central Technical Development Fund (KMÜFA). In the centrally planned economy a weird system existed for the collecting of KMÜFA.

Companies were obliged to form a so-called Technical Development Fund in their balance sheets. There were different preset percentages of the turnover, depending on the nature of the different branches of the economy. A linearly increasing tax was levied on the actual spending of this fund. Due to this system the more a company spent on R & D, the more it paid to the government as tax.

Central Technical Development Fund (KMŰFA)

In 1988 a new law was introduced. According to the present system all companies pay a tax-like contribution to the Central Technical Development Fund, calculated as 4.5% of the previous year's profit.

The whole question of centralization is under heavy discussion. There are also methodological problems in the statistical calculations of R & D spending. I shall come back to this after the discussion of the institutional breakdown of the Hungarian R & D.

(2) R & D Institutional System in Hungary

TABLE 8

R & D UNITS IN HUNGARY (1990)

Type	Number of units	%
Research institutes	69	5.1
from this:		
budgetary	56	4.1
profit-oriented	13	1.0
University	940	69.2
Manufacturing and service companies	174	12.8
R & D companies	98	7.2
Other	78	5.7
Total	1,359	100.0

Source: Yearbook of the Central Office of Statistics (1990), p. 278.

In 1989, there were 1,359 R & D units in Hungary. The institutional breakdown can be seen in Table 8. In Hungary, the Central Office of Statistics did not collect data on all the 1,359 units of Table 8; only 1,256 of them are permanently observed. Mainly the so-called R & D companies are missing due to their small size.

TABLE 9

DATA ON R & D UNITS ACCORDING TO TYPE (1990)

		R&D institutes	University	Company	Other	Total
No. of employees* from this	(thousand people)	11.9	8.8	13.0	2.6	36.3
graduated		5.2	5.2	5.7	1.5	11.6
Expenditures**	(million HUF)	8704.2	4806.1	9528.2	1442.1	24480.6

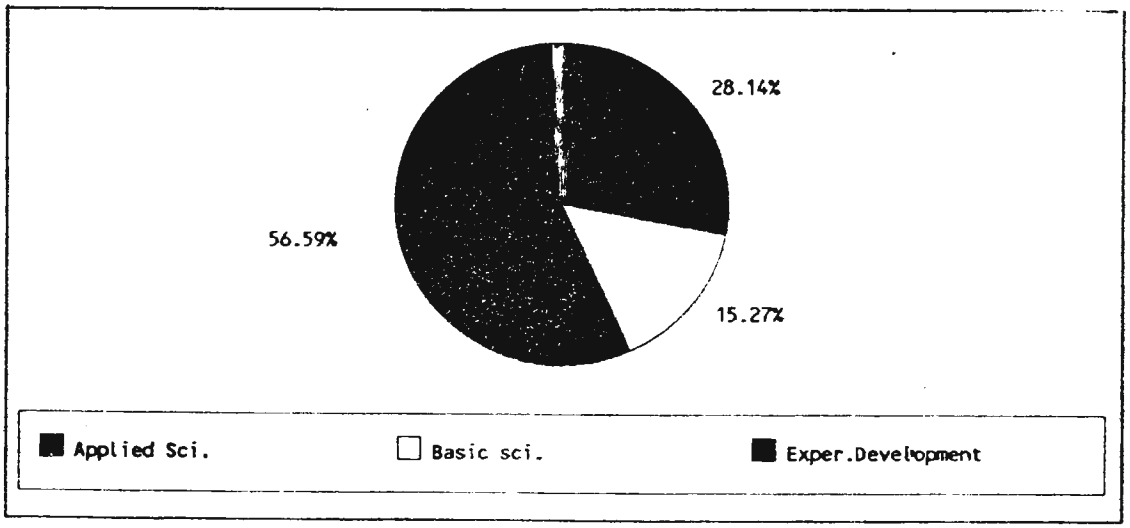
* Full-time equivalent.
** Without non-R & D expenditure.

Source: Yearbook of the Central Office of Statistics (1990), p. 278.

Table 9 contains figures for the observed units. According to this Table there were 36,400 full-time equivalent employees, and the expenditure of the observed units amounted to 24.5 billion Ft in 1990. In comparison with total national expenditure 9.2 billion Ft were spent outside the observed area, roughly one quarter of the total sum. There are certain doubts about the real R & D utilization of this money.

FIGURE 6

R & D EXPENDITURE ACCORDING TO THE TYPE OF UTILIZATION (1990)

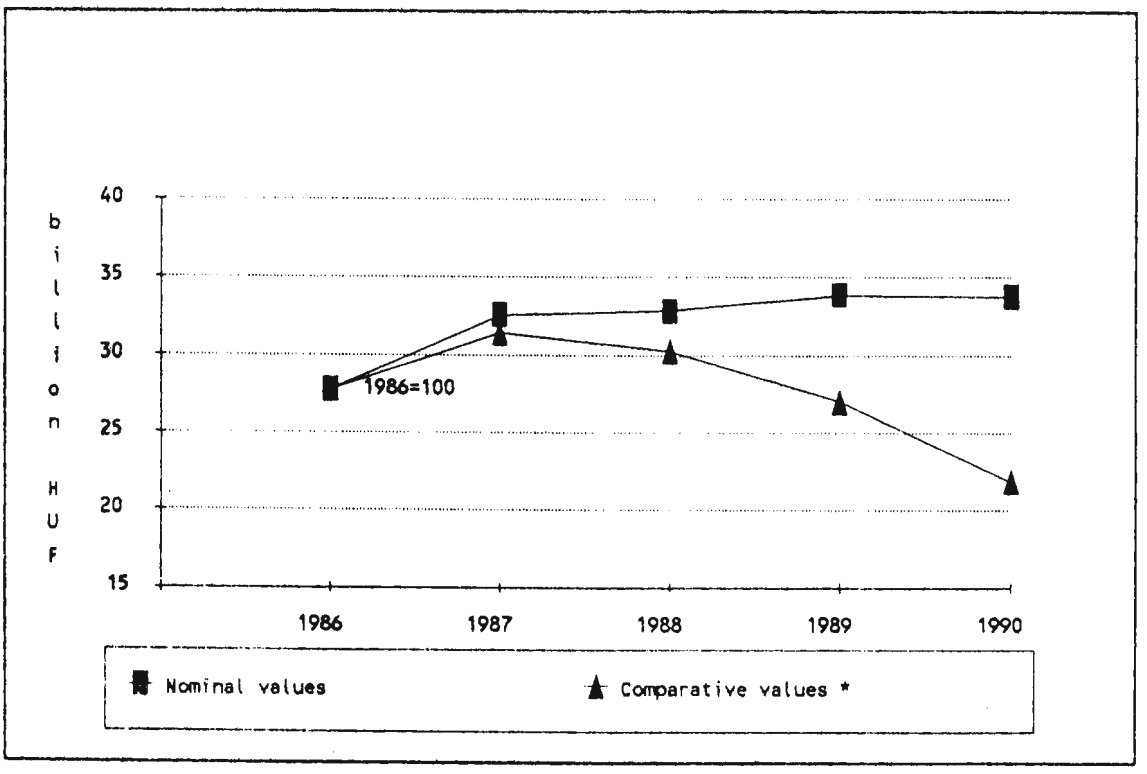


Source: Yearbook of the Central Office of Statistics (1990), p. 278.

The distribution of expenditure among basic and applied sciences and experimental development can be seen in Figure 6.

FIGURE 7

R & D EXPENDITURE IN HUNGARY
1986-1990



* Corrected for inflation by industrial price index.

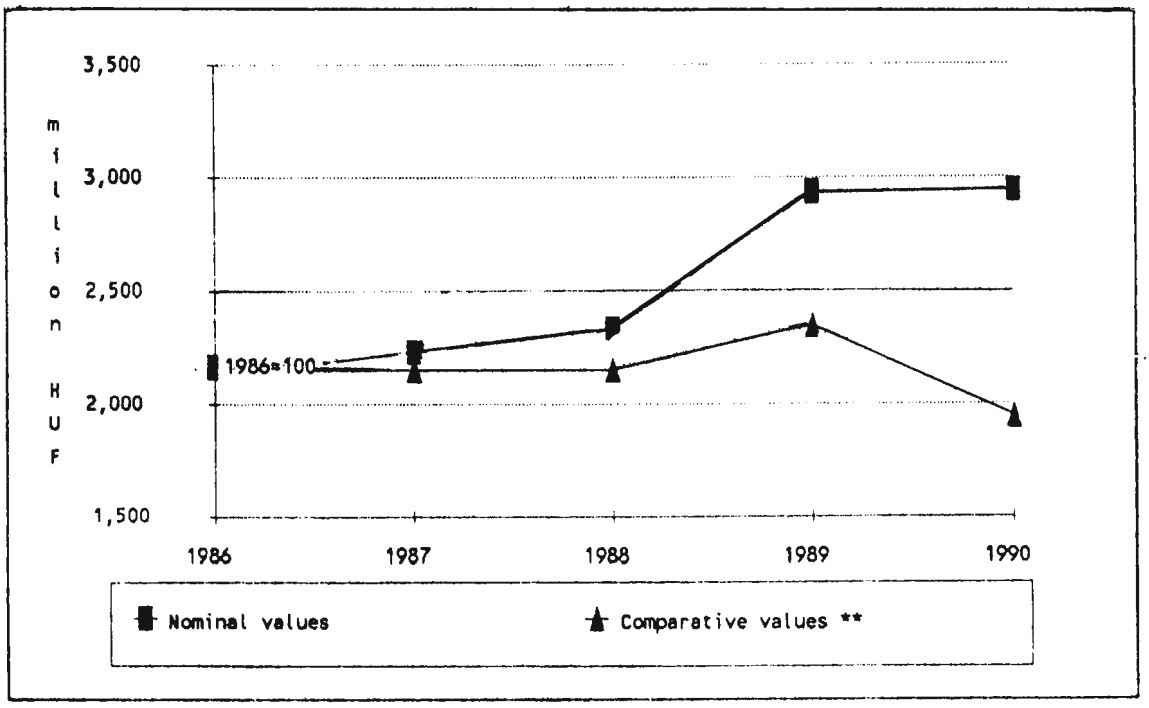
Source: Yearbook of the Central Office of Statistics (1990), p. 278.

One of the most exposed areas of the Hungarian economic crisis is the field of R & D. Between 1987 and 1990 the nominal value of expenditure was about the same, but due to the high inflation rate the real value has decreased by more than 30%.

In Figure 7 the nominal values were corrected by the actual industrial price index. Even more dramatic decline can be expected in 1991 when even a small reduction in nominal value and a 29% industrial price index are forecast.

FIGURE 8

R & D EXPENDITURE OF
SIX HUNGARIAN PHARMACEUTICAL COMPANIES*
1986-1990



* Alkaloida
Biogal
Chinoin
EGIS
Reanal
Richter

** Corrected for inflation by industrial price index.

Source: Based on data of the corresponding annual reports.

Parallel to the nationwide decrease similar reductions exist in industry. Figure 8 shows the data of the six largest Hungarian pharmaceutical companies which are among the biggest spenders of the whole industry.

In my personal opinion the quality of results in research depends first of all on the money invested in the activity, provided the observation is made in a sample big enough (i.e. large organization, branch of industry, country).

The decline in Hungarian R & D expenditure can be measured in the results as well.

TABLE 10

NUMBER OF HUNGARIAN PATENT APPLICATIONS

	1985	1986	1987	1988	1989	1990
Number of applications filed by domestic companies	2,904	2,848	3,229	3,262	2,657	2,506

Source: Iparjogvédelmi Szemle (1991), Vol. 96, No. 1.

Table 10 contains the number of patent applications filed in Hungary by domestic companies. The peak was in 1988, since then there has been a steady decrease.

TABLE 11

NUMBER OF HUNGARIAN SCIENTIFIC PUBLICATIONS IN NATURAL SCIENCES

	1984	1985	1986	1987	1988	1989
Number of publications	2,427	2,329	2,156	2,184	2,162	1,921

Source: Collected from the Science Citation Index.

A similar tendency can be tracked down in the number of scientific publications, registered by the Science Citation Index files in natural sciences (Table 11).

A recent survey examined the length of time that individual Hungarian products have been in production. It was found that 40% were older than 15 years and only 14% less than three years old.

(3) Research Institutes in Hungary

There are basically two types of research institutes: budgetary and profit-oriented (see Table 8).

(3.1) Hungarian Academy of Sciences

It was founded in 1825 from public donations; it represents the headquarters of basic science in the country. As can be seen in Table 12, 37 of the budgetary research institutes belong to the Academy, with almost 2,800 scientists.

TABLE 12

SCIENTIFIC NETWORK OF THE
HUNGARIAN ACADEMY OF SCIENCES (1990)

Science Field	No. of Research Institutes	Scientists
Natural	12	1,280
Technical	4	525
Medical	1	45
Agricultural	4	192
Social	16	722
Total	37	2,764

Source: Special Report on the Progress of R & D Structures in Hungary, OMFB (1991), p. 9.

TABLE 13

INCOME STRUCTURE OF THE RESEARCH INSTITUTES OF
THE HUNGARIAN ACADEMY OF SCIENCES (1990)

Source	Total income = 100%
State budget	32.2
Central techn. dev. fund	6.4
Special government funds	8.9
Company contracts	37.4
Other	15.1

Source: Special Report on the Progress of R & D Structures in Hungary, OMFB (1991), p. 10.

Table 13 shows the distribution of their income according to their sources. In Hungary the Academy has a special significance, greater than in other western countries. It coordinates the whole scientific life but at the same time it is a rather "closed world." In connection with the Hungarian Academy of Sciences, I have to discuss two general problems as well which mainly affect the Academy, namely:

(a) scientific qualification, and

(b) "brain drain."

FIGURE 9

SCIENTIFIC QUALIFICATION SYSTEMS

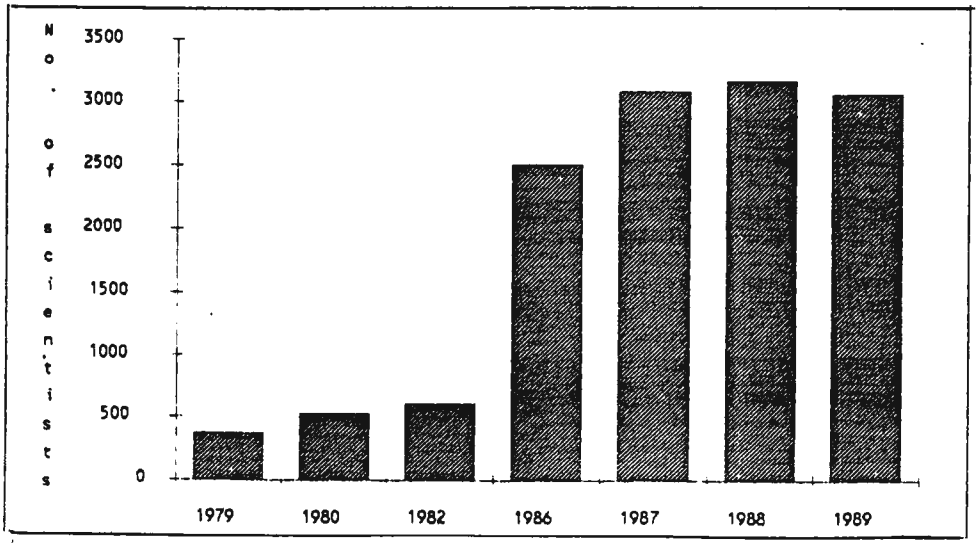
Present levels	Planned levels
1. Univ. Dr.	1. Ph. D.
2. Candidate (Ph.D.)	
3. Doctor of Science	2. Doctor of Science
4. Associated member of the Hung. Acad. Sci.	3. Member of the Hung. Acad. Sci.
5. Full member of the Hung. Acad. Sci.	

ad(a) In Hungary we have a Soviet-type five-grade scientific qualification system (Figure 9). We are planning now to reduce the number of levels to three only. In Hungary a monthly government bonus is given to all scientists with a higher scientific grade. This is the main reason for the relatively slow introduction of the new system.

ad(b) The prestige of the scientific profession has been steadily eroding in Hungary. The salaries are low, R & D organizations are not able to keep abreast with inflation in the raising of wages. On the other hand, there is a great demand for hiring Hungarian scientists in the developed countries, especially in the United States of America.

FIGURE 10

HUNGARIAN SCIENTISTS ABROAD
1979-1989



Source: Napi Vilaggazdaság, December 13, 1991, p. 9.

Figure 10 shows the number of Hungarian scientists working abroad. In 1989, this part represented about 15% of all Hungarian scientists; their qualifications are better than the Hungarian average.

(3.2) Profit-Oriented Research Institutes

In Table 8, 13 institutes appear under this heading. However, among the so-called R & D companies 19 can be qualified as research institutes differing from the other R & D companies mainly in size only. The profit-oriented institutes have their origin in the 1950s when a whole network of them was set up following the Soviet pattern.

They used to work under the authority of the corresponding ministry. Their tasks were to fulfill innovation requirements in the different branches of both industry and agriculture. The reasoning behind this system was to centralize scarce facilities and experts. Many scientific and technological achievements were originating from these institutes. Later on manufacturing companies have also established their own R & D facilities and tended to utilize in-house results, tailored according to their own needs and possibilities, supported by their own marketing.

The profit-oriented R & D institutes started to be isolated. The whole situation has been aggravated by the present chronic lack of funds. The government is cutting allowances in order to save money for other purposes and the companies are not able to spend more on R & D due to the heavy taxation and strong inflational "wage pressure." Many of these research institutes have gone or are going bankrupt. There is an urgent need to save the existing profit-oriented institutes. According to present plans they should separate their non-profit and profit-oriented activities.

The non-profit part (mainly applied research) would be combined nationwide into a non-profit organization network under community control and with basic budgetary support (along the pattern of the German Fraunhofer Institute). The Ministry of Justice works on the legal background, the Ministry of Finance on the financial system of sponsoring.

(3.3) Institute for Drug Research

FIGURE 11

INSTITUTE FOR DRUG RESEARCH (IDR)

Largest preclinical research and development facility in the Hungarian pharmaceutical industry

Number of employees	630
Number of graduate research workers	262
Number of Hungarian patents granted since 1950 ..	602
Number of original drugs (NCE-s) registered in Hungary since 1950	9

The Institute for Drug Research (IDR) in Budapest is one of the above-mentioned industrial research institutes. The history of the IDR is a

good example for the troubled fate of the industrial R & D institutes. Basic data of the IDR can be seen in Figure 11. However, due to some special peculiarities the IDR is in a somewhat better position than others. The reasons for this are the following:

(a) The pharmaceutical sector is one of the most developed branches of industry in Hungary.

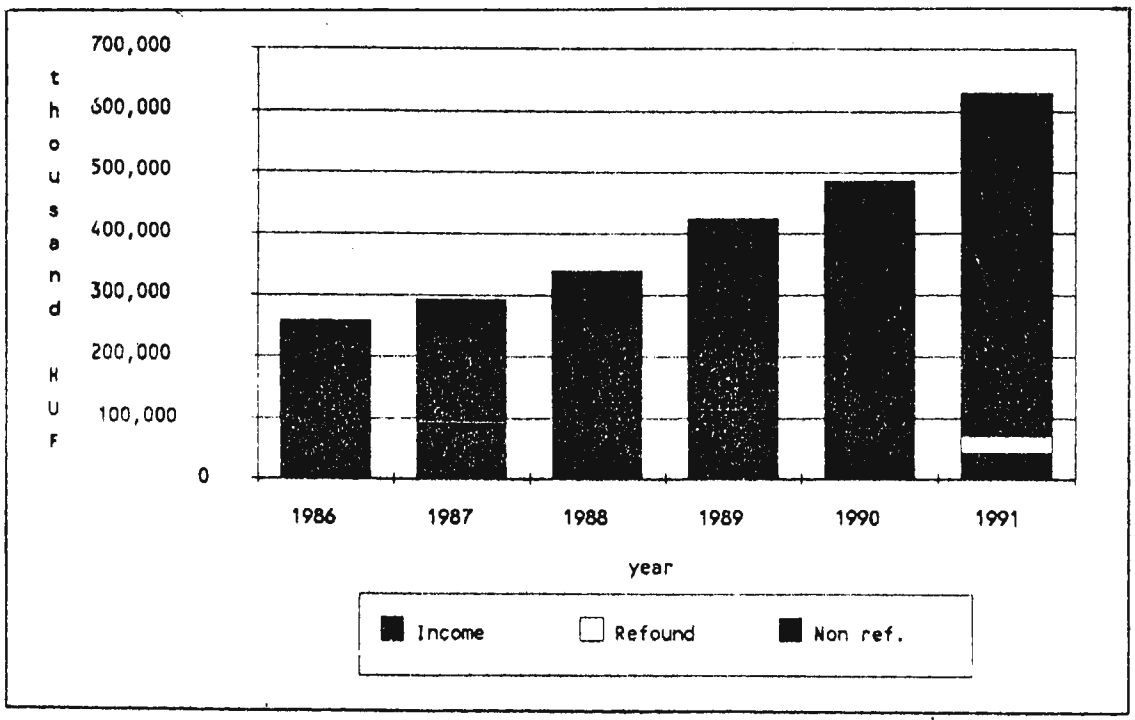
(b) Between 1950 and 1982, IDR functioned as the central R & D facility of the pharmaceutical industry. In 1982 the IDR was given to the six major Hungarian state-owned pharmaceutical factories (working with a couple of thousand employees each) in the framework of a government program for the selective development of certain areas of the industry. This seemed to be an early example of privatization in a communist way.

Between 1982 and 1992, IDR was a joint venture of these six companies, each in equal parts. From the beginning of this year, the IDR was transformed into a limited liability company.

Belonging to the industry seems to be beneficial for us as the IDR makes its living from R & D contracts.

FIGURE 12

GOVERNMENT CONTRACTS IN THE IDR'S TOTAL INCOME
1986-1990, 1991 expected



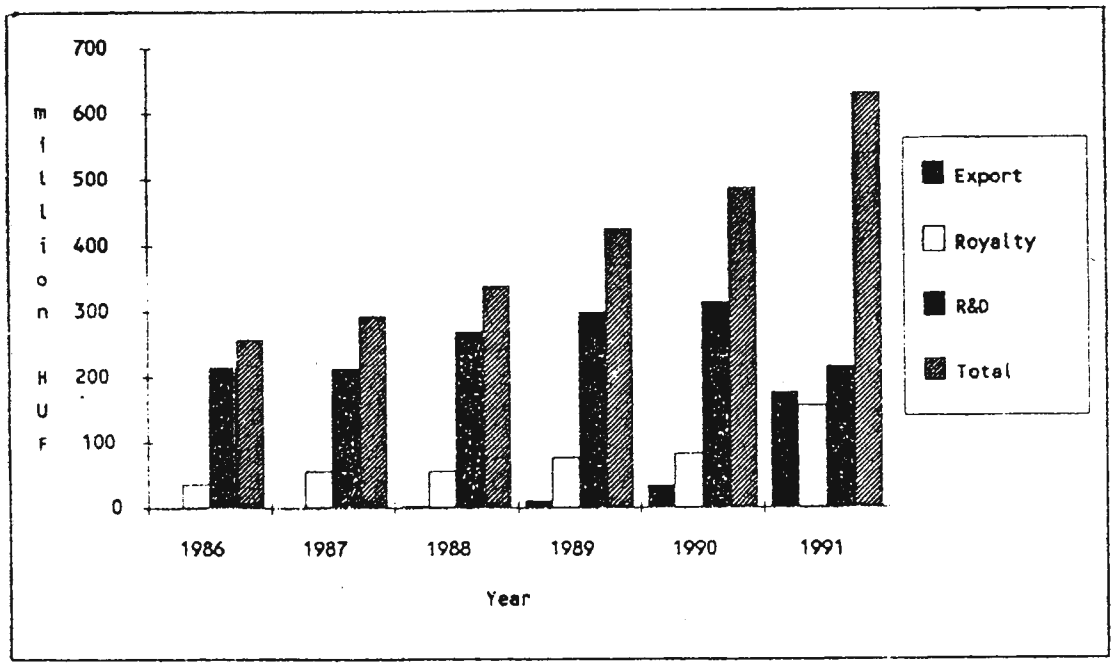
Earlier a large part of contracts was given by the government. It can be seen in Figure 12 that budgetary contracts and supports gave a significant contribution to the total income of the IDR.

Nowadays the proportion of this has decreased and a great part of the government contracts is refundable, in fact it has become an interest-free loan.

However, this is not to be underestimated in an age when interest rates in Hungary amount to 40%.

FIGURE 13

INCOME OF THE IDR
1986-1990, 1991 expected



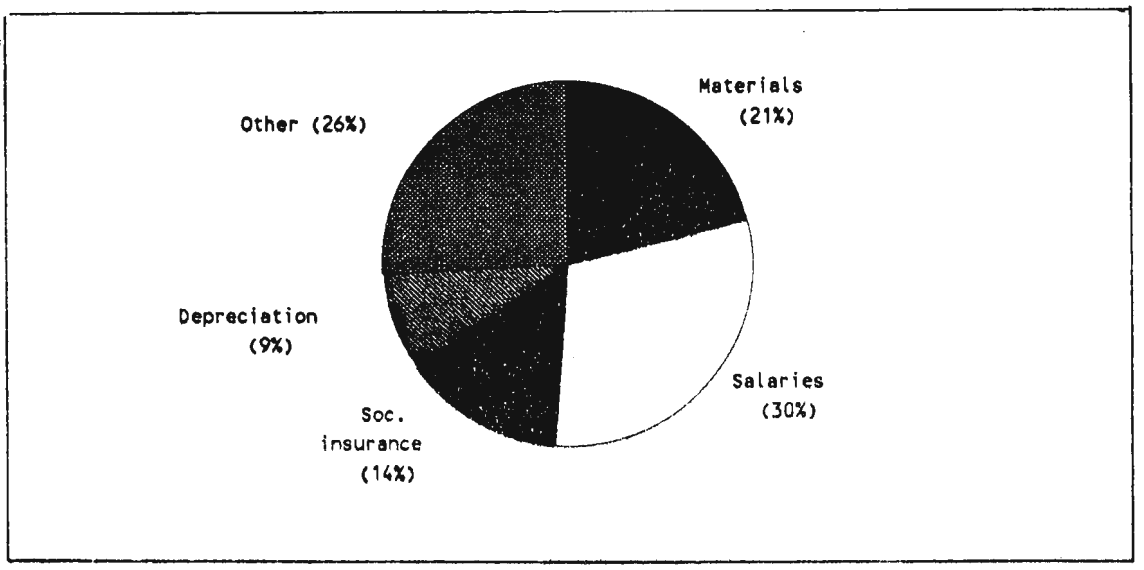
The above-discussed characteristics of the Hungarian R & D can be seen in Figure 13.

During the past couple of years the decreasing amount of domestic government and company contracts has been replaced by a steadily increasing amount of expert R & D work, performed mainly for US and Japanese companies.

The IDR has also a significant royalty income. In 1991 the IDR licensed one of its drug candidates to Eli Lilly US, a multinational pharmaceutical firm.

FIGURE 14

COSTS AND EXPENSES OF THE IDR IN 1990
(Total: 432.1 million HUF)



The structure of the cost and expenses in Figure 14 clearly shows the vulnerability of R & D institutions in inflational times. The most significant expense is wages and social insurance connected with it which is disproportionately high in Hungary, 44%.

OUTLOOK FOR THE FUTURE

It is not necessary to emphasize that Hungary badly needs a great deal of R & D work in the coming years. To restructure the economy, to increase the quality of products, all requires research and development.

Hungary has signed a treaty with the European Economic Community to become an associated member. According to the contract we have to harmonize our legal system with that of the EEC. For example we have to introduce the product patent system by 1997. But things proceed very fast, and according to the present negotiations this introduction of the product patent system is scheduled for much earlier.

The government is well aware of the present difficulties and tries to find means and tools to overcome the obstacles.

Beside the foundation of the non-profit organization network mentioned above, new legislation is under preparation (Acts on the Hungarian Academy of Sciences, higher education and innovation).

However, our best hope is the recovery of the whole Hungarian economy which is expected for the end of 1992.

TOPIC 4

UNIVERSITY-INDUSTRY LINKS; LICENSING; TECHNOLOGY TRANSFER ARRANGEMENTS; RESEARCH AND DEVELOPMENT

by

Mrs. Katharine Ku
Director
Office of Technology Licensing
Stanford University, California
United States of America

We who are involved in the "Promotion of Invention and Innovation" work at the interface of science, business and law. Those of us involved in the promotion of invention and innovation within the university sector also work at another interface: the interface of university, government and industry. Because of these six rings of interlocking relationships (science, business and law linked with university, government and industry), we find that the work is always interesting and the challenge is great. In order for technology transfer from the university to be successful, however, the university must have policies that enable technology transfer; the government must have laws and attitudes that support such transfer and industry must be willing to work with universities to foster the commercialization of university research results. In this talk, I will discuss the various linkages and how they affect technology transfer in the US.

I. GOVERNMENT POLICIES

After World War II, the US Government, through approximately 26 various agencies, began funding research at universities at significant levels. In those days, these agencies, such as the National Science Foundation, the Office of Naval Research, Department of Energy, etc., each established their own patent policies regarding the transfer of technology resulting from the federally-funded research. Only a few universities had a technology transfer function because the bureaucratic paperwork and complex regulations were confusing and, frankly, not worth the effort for most universities. Beginning in the late 70s, there was (and still continues to be) a great national concern about competitiveness, innovation and technology transfer in the broad sense. The US Government realized and recognized that when the government retained title to federally-funded inventions, the government was not usually able to transfer the technology in an effective way and that most government-owned inventions were not being developed by industry. In 1980, an important law (known as Public Law 96-517, Patent and Trademark Law Amendments Act of 1980) was passed which automatically and uniformly gave universities the first right of refusal to take title to inventions made in performance of government grants and contracts. The law, a milestone in government/ university technology transfer, contains the following general provisions:

1. grants universities first option to assert title to inventions; if the university declines, title passes to the government;

2. requires sharing of net royalties with inventors and allows universities to retain royalties for research and education;

3. requires universities to give preference to US companies; and

4. requires that the US Government be given a royalty-free license for governmental purposes.

The law, which was designed to encourage US universities to set up their own technology transfer operations, has resulted in extensive technology transfer efforts by universities. In 1980, there were about 65 members of a small organization called "The Society of University Patent Administrators" (SUPA); today, the same organization has renamed itself "The Association of University Technology Managers" and has a membership of over 650.

II. UNIVERSITY

Although each university has its own special personality and character, universities in general do share many common goals and purposes. I will first give a broad overview of a university environment and then focus on the various aspects of university-industry links.

The common purpose of universities is research, education and public service. The primary objective of universities is to create and disseminate knowledge through free and open exchange. In general terms, universities are in the business of transferring "old or known" knowledge and generating "new" knowledge. Within the university environment, technology transfer from the university to industry occurs in many ways. The most common and most important means of technology transfer is through the graduated student, who takes what is learned at the university and applies that knowledge to industrial problems. The next most common means of technology transfer is, of course, through the publication of important scientific results through scientific journals. In the university environment, the first to publish is much more important, and should be, than the first to patent.

Universities interact with industry in several official ways: usually through gifts to the university; or research funding; or licensing. I will briefly describe gifts and research funding and go into more detail about licensing relationships.

UNIVERSITY-INDUSTRY LINKAGES

Development Office:
Gifts, Industrial Affiliates

Sponsored Projects Office:
Contracts and Grants for Externally Sponsored Research

Technology Licensing Office:
Technology Transfer, Royalty Generation


STANFORD UNIVERSITY
OFFICE OF TECHNOLOGY LICENSING

A. Gifts

In the US, most universities have a "development" office which solicits gifts from industry. For fiscal year 1990-91, Stanford received a total of $180 million from all donors: of that amount, $42 million was from industry. These monies are "gifts" because there are no conditions, such as patent rights, reports, work statements, etc., attached to the funds. Certain gift-supported programs are called "Industrial Affiliate Programs" which are membership programs supported by corporate gifts to facilitate the transfer of knowledge into society and to encourage a dialogue between academia and industry. Although these industrial affiliate programs do not provide formal access to intellectual property rights, these programs offer "facilitated access" to members, often through scientific symposia for member companies, where such company scientists can meet graduate students and learn about early research results. The purpose of the industrial affiliate program is to provide channels for convenient and direct communication between faculty and their industrial counterparts.

B. Research Funding

Research funding through grants and contracts is an important source of funding for universities. Research in most universities in the US is funded 85-95% by the US Government; at Stanford, for example, the US Government funds approximately 85% of the $327 million research effort: $283 million Federal government funding, $44 million non-federal funding and of that non-federal funding, $13 million comes from corporations. If a company sponsors (supports) research at a university, the company is generally able to receive certain rights to inventions that come out of the research. A company also has the right to review publications and to ask for a specific commitment in terms of personnel effort within a general work statement. Research at most universities, however, must be open because the principle of freedom of access to the underlying data is of overriding importance. Many universities do not wish to do product development or feel that they are a research arm of a corporation; however, if there is true research to be accomplished, most universities are eager to collaborate with industry. Companies such as Takeda, Hoechst, Shiseido, Sandoz, Monsanto, etc. have established major research agreements with universities with the hope and expectation that such collaboration will be beneficial for both parties.

C. University Licensing

Licensing is the third formal link between university and industry. Newspaper headlines are often misleading: one from a newspaper in Boston says that "Colleges rake in millions for prof's inventions." The reality is that for most universities, licensing income is a very small part of the overall revenues. In 1990, US universities received almost 1,200 US patents but royalty income was only $60 million.

In order to have a viable licensing program, a university must have a patent policy which enables and encourages technology transfer. Because most sponsors of research, including the US Government, require the university to take title to inventions, US universities will generally, at a minimum, require that the university take title to sponsored inventions, which is the case with Stanford. Many other universities require that inventors assign

title to any invention made using university facilities; such is the case with the University of California.

PATENT POLICY

* Rights remain with the inventor if possible

* University retains rights if required by contract and grants for sponsored research

STANFORD UNIVERSITY
OFFICE OF TECHNOLOGY LICENSING

Universities with patent policies generally also have royalty sharing policies to provide an incentive to the researcher to participate in the technology transfer process. At Stanford, for each invention, 15% of the gross royalty income is deducted for administrative expenses. After any direct expenses--typically patent costs--are deducted, net royalties are divided: 1/3 to the inventor(s), 1/3 to the department and 1/3 to the school. Other universities have a 50-50 sharing, or a sharing whose percentage changes, depending on the royalty income level.

The purposes of a university licensing office are generally twofold:

1. to promote the transfer of technology for public use and benefit; and

2. where consistent with the first goal, to bring in royalty income for research and education.

With respect to the purpose of "transferring technology," a university licensing office disseminates information to industry by informing companies about inventions and technologies which have commercial potential. In spite of publications, it is easy for university technology to "lie fallow in the literature"; industry often does not recognize the commercial potential of a university invention because it is often very early-stage--"before its time"--requiring 5-10 years development time before it can be introduced into the marketplace.

The second goal of a university licensing office is the generation of royalty income for research and education. If a licensing office is successful in pollination of university technology to industry, a license agreement containing diligence provisions and royalty provisions (e.g., issue fee, minimum annual royalties, earned royalties based on sales) is the likely outcome. Stanford has been one of the most successful universities in recent years in generating royalty income. In 1990-91, the Office of Technology Licensing generated $25.6 million total, with 16 inventions out of 142 generating more than $100,000. Most of the inventions generating over $100,000 were 10-15 years old, with the basic DNA cloning patents generating $16.9 million. The DNA patents, which will expire in 1997, are a reminder that technology licensing is a cyclical business.

STATISTICS

1990-91 Royalty Revenue: (includes one-time payments of $6.2 M)		$25.6 Million
To other Institutions:		$7.6 M
To Stanford Schools:		$4.6 M
Medicine:	3.2	
Engineering:	.4	
Humanities and Sciences:	.6	
Provost/Research:	.3	
Other:	.1	
To Stanford Departments:		$4.6 M
To Stanford Inventors:		$4.6 M
To OTL Research Incentive Fund		$2.3M
Cumulative Royalty Revenue:		$86.889 M

SOURCES OF 1990-91 ROYALTY REVENUE*

DNA Cloning patent	$16.9 M
Software and copyrightable material:	.6 M
Emblematic Ware	.4 M
Other:	7.0 M

*Sixteen technologies out of a total of 160 brought in over $100,000;
These 16 cases totalled $23.7 M or 92.6% of the revenue.

STANFORD UNIVERSITY
OFFICE OF TECHNOLOGY LICENSING

It is important for a licensing office to "break" even at the minimum and, ideally, to be able to return some income to the inventors and to the university for research and education. Since the money is "unrestricted income," royalty income is particularly valuable to a university because the funds can be used for uncertain research projects, scientific conferences, postdoctoral fellows, etc.

But it is also important to note that the basic purposes of the university always take precedence over licensing considerations. While a university recognizes the benefits of patent development royalty, it is more important that the direction of university research should not be established or unduly influenced by patent considerations.

1990-91

OTL Budget	$1.27 Million
Direct Expenses:	$ .3
Current OTL staff:	20
New technology disclosures	141

How do we do licensing? Stanford's Office of Technology Licensing has a staff of 20 people, half of whom can be considered licensing professionals and the other half are administrative support staff. When a new invention is disclosed to our office, the Licensing Associate must make an evaluation about the commercial potential of the invention; one effective way to evaluate a technology is by contacting someone in industry who can give us a perspective on the invention. For example, if the invention is a medical device, we would contact a company which is perhaps selling a related product, to see if that company would be interested in licensing our technology. By doing this, we are hoping to get industry input, either positive or negative, which will help us put a value on the technology.

WHAT WE HAVE TO OFFER

intellectual property information
technology evaluation
technology licensing
emblematicware licensing
software distribution
material transfer agreements
technology commercialization information

At this point in time, we may or may not have filed a patent application. If the Licensing Associate believes strongly that the technology is licensable (i.e. commercially feasible), then we may have decided to take the risk and spend the money to file a patent application before we had any feedback from industry. If there was uncertainty about the commercial potential of the invention, we would have waited on making the filing decision until after we had received input from industry. It is very easy to spend money on patent filings for inventions which are never licensed and so we try to be particularly careful when making this initial filing decision.

TECHNOLOGY TRANSFER AT STANFORD

Inventions

Patents

Software

Biological Material

Semiconductor Masks

Copyrightable Material

Emblematicware

Stanford actively seeks licensees. We send letters, make telephone calls, etc. to our various contacts within industry to try to find a company which has the vision and is willing to invest the time and effort necessary to commercialize an invention. If we are able to find such a potential licensee, we then negotiate a license agreement. We are willing to grant exclusive licenses if such licenses act as an incentive for the company to develop the product. We also grant many nonexclusive licenses for technologies that may be useful for a company but do not give any one company a particular advantage in the marketplace.

INTERESTING INVENTIONS

Recombinant DNA
FM Sounds in synthesizers
Fluorescent Tags
Medical Imaging Technology
Cell Sorter
Gene Amplification
Research Reagents
MINOS software
V System Software
Emblematicware
Laser technology

STANFORD UNIVERSITY
OFFICE OF TECHNOLOGY LICENSING

Once a license agreement has been signed, we believe that the agreement represents the beginning of a mutually beneficial long-term relationship with the licensee. Our Licensing Associates stay in close contact with our licensee-companies and generally are able to make modifications, adjustments,

amendments to the original agreement if the invention development timetable or market conditions change. If the licensee is successful in bringing a product to the marketplace, we then have been successful in our job of transferring university technology to industry.

A few statistics: Stanford receives about 140-160 invention disclosures a year. We file patent applications on about 25% of those inventions and we license about 50% of the inventions on which we filed, i.e., we license about 12-1/2% of the inventions disclosed to us. Licensing occurs within a few months to a few years from disclosure. A "major" case will product significant income only after 5-10 years from disclosure but most cases produce modest income. In most cases, there is a short "window in time" in which the invention is licensable.

III. INDUSTRY

The third ring in the university-government-industry interface is industry, whose support and interest in university technology are essential to the success of technology transfer.

If a company is willing to look at early-stage technologies which may require long-term investment to commercialize a product, the company may be able to:

1. augment its own existing technology portfolio;

2. bypass current technology and move quickly into future technologies; or

3. be the first in the marketplace with a revolutionary technology.

Universities are willing and able to grant exclusive licenses when exclusivity is needed to encourage development. In other cases, such as with the basic recombinant DNA patents, universities will grant non-exclusive licenses to many companies.

University technologies which have been the most lucrative for industry have often been technologies that never existed before so that markets were not easily identifiable or quantifiable at an early stage.

Some of Stanford's technologies that have been commercialized include: FM Music Synthesizer licensed to Yamaha, Fluorescent Activated Cell Sorter licensed to Becton Dickinson, the Acoustic Microscope licensed to Olympus and Computer-Aided Tomography technologies licensed to General Electric. Stanford has many other technologies, including software, licensed both exclusively and non-exclusively, which are now on the market.

SUMMARY

It is a challenge to transfer technology from the university sector to industry. To be able to do so successfully, I believe that

1. universities need to have intellectual property policies in place and the desire to promote technology transfer;

2. the government must be supportive and encourage, through laws and regulations, such university-industry technology transfer;

3. industry must be receptive to new ideas generated by universities and be willing to invest the time and money to develop early-stage inventions.

I also believe that all three rings need to work together, rather than separately, to accomplish the broad goal of transferring technology from the university sector to industry so that society--including the inventors, university, industry and the government--can benefit.

TOPIC 5

DEVELOPMENT AND COMMERCIALIZATION OF INVENTIONS (FINANCING, VENTURE CAPITAL, PATENTING, AND THE ROLE OF "ENTREPRENEURS")

by

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The idea of the laser came to Gordon Gould in a flash and many years after his invention he is still reaping the benefits of his invention. Gordon Gould could not sleep once the idea hit him one winter night in 1957. A graduate student of physics, at the Columbia University, Gordon had suddenly conceived the way to amplify light into a powerful beam of energy. He described the process LASER--light amplification by stimulated emission of radiation. Since that time lasers have gained immensely in their importance and application in numerous areas of modern life. Among other things, lasers are used to cut and weld metal, produce sonic perfection in compact disc players and carry telephone signals through fiber optic cables.

Mr. Ray Dolby cashed in on his invention of the noise-reduction circuit, now used the world over in tape players. Mr. Dolby set out to make a fortune by licensing his circuit to the world. His strategy still serves as a model for ideas' merchants. The first Dolby "signals to noise stretchers" were large, expensive and used in professional recording studios only. Soon Mr. Dolby invented a cheaper version called Dolby B, which was licensed to producers of hi-fi cassette recorders. Besides the quality of the idea, Mr. Dolby's strategy was based on four platforms:

- Patents: The Dolby noise reduction circuits were completely protected by patents and therefore insured against imitation.

- Exposure: Mr. Dolby insisted the name and trademark appear in all products using his circuits.

- Quality assurance: As the Dolby company got involved in implementation of its technology, licensees were required to meet Dolby's own quality standards.

- Continual improvement: Dolby has created several generations of its products. Some improvements were simple technology upgradations while others were complete revisions of Dolby's own ideas.

Like in the case of Dolby, traditionally product builders have been very secretive of their ideas and technologies to keep rivals at a distance and capitalize on their own technology. But lately the trend, especially in computer companies, has been that of "open systems." Open systems means technology understood by all and licensed on reasonable terms. Selling products based on in-house technology has helped Microsoft and Sun to be placed amongst America's biggest companies.

To achieve this the two companies as a matter of policy made it relatively easier for rivals to imitate their products. The result has been market leadership for Sun and Microsoft. As these companies get public with their internal technological debates, they tend to attract bright young engineers. So what they lose by spilling their ideas today is more than made up by these young wizards who will create tomorrow. But it may also be understood that companies like Sun and Microsoft may become open with basic technologies, but at the same time they hold back the flashy extra features to their products, which differentiates their products from others.

The immense commercial potential in a unique and good idea has made ideas the fastest moving items in global trade. A new idea may be bought, borrowed or sometimes even stolen, but is good only till it is hot. From Walt Disney's Mickey Mouse to Steve Job's Apple personal computer, a good idea has been the start of every business' success story. More so, some companies have used their new found intellectual property rights as a stick to beat the competitors with.

The idea generation or innovation, whether of a product or process, is a complex affair. Innovations and inventions may take place within a company and may not be noticed by outsiders. Even though patents are tangible records of inventions they do not highlight as to who is earning the most profits from it. An inventor may hold patents to a machine, but in fact the person or company using it are the real benefactors. In other words, development and commercialization of inventions start with the diffusion of the idea into industry and economy. Successful diffusion is again directly proportional to the reliability, quality and flexibility of the idea. It is possible that technologies developed for one use may find commercial applications elsewhere. An illustrative example could be the use of the steam engine in transport whereas the original invention was to pump out flooded mines. Therefore, the key to commercialization of an invention is its application. That is, where, when and how the idea is used. As the technology evolves, more individuals or companies acquire it. This diffusion is slow to start with, followed by rapid increase and finally taken up by a few laggards. Adoption of a new idea needs new investment and therefore a growing economy can offer the best ground for commercialization. Usually the idea may be picked up by large companies which may be able to afford the financial risks of being a pioneer. Being a pioneer may prove costly and risky, but companies may be willing to do so to develop a culture of inventiveness and at the same time improve by the time imitators catch on.

The world as it is today is the outcome of a process of invention and evolution. The key to an invention's success lies in the structuring of the idea for repetitive use commercially. Unfortunately, all the inventors do not have the capability, knowledge or resources to commercialize the invention and, thereby, reap benefits from it. For example, it took Gordon Gould 28 years to win patents that are making him a multimillionaire. By his own admission, Gordon Gould was ignorant of the fact that he need not have a working model of his design to apply for a patent. By the time he applied for one, several other researchers had received or filed for a patent that overlapped Gould's. The exercise saw Gordon Gould searching for financial backers to help him meet the costs of long legal battles needed to clear the tangle of claims. In other words, to be fair to the inventor and for the society to gain from the invention, there is a need of institutionalizing the invention for commercial success.

Inventions are made in various countries and the commercial exploitation of those inventions is within the own rights of the country. What this calls for is a well structured international forum or guidelines to carry the benefits of the invention across borders, but at the same time safeguard the rights of the inventor and his/her country. Intellectual property rights have become one of the most talked about subjects in international trade. Most countries believe in patents, copyrights and trademarks, but what they do not agree upon is how these rights should be enforced or how they may be applied to new technologies, innovations and improvisations. Even though these issues are within the GATT spectrum of negotiations, some countries are already imposing intellectual property rights in disguised ways. Europe is tightening intellectual property protection under the guise of euro-standardization and lawmakers in America are becoming more aggressive and strict. This explains super 301 and section 337 of the U.S. 1986 Omnibus Trade Act, which gives American companies sweeping new powers to stop imports, which they believe are infringing their intellectual property rights.

It may also be recognized that though economically stronger countries may have an environment more conducive to invention, they might not have all the skill necessary for commercial exploitation of the invention to the fullest extent. Exchange of information about invention can lead to improvisations and thus commercial exploitation towards the most optimum uses. There has to be a smooth mechanism to transfer knowledge of invention in order to achieve maximum welfare for all countries of the world without depriving the inventor of his dues. The terms of such transfer of ideas should not be repressive in the social interest. As the modalities, efficacies and intricacies of such an exchange would differ from time to time, case to case and country to country, disputes are inevitable, but such disputes would need to be resolved in the most mutually convenient manner.

Since development of inventions has to take place within the framework of the economic and political setup of a country or across borders, it is a function of a country's research and development base, its scientific pool and industrial infrastructure to successfully diffuse the invention. Therefore public policy in designing these factors becomes conspicuous in the development and commercialization of inventions.

In Britain, the United States of America and France, policy towards technology has a top-down approach, which is setting priorities of national importance and thus dedicating federal funds to activities in these priority sectors. By contrast the approach in Germany, Switzerland and Sweden is bottom-up, which ensures better response to the need of the market. The Japanese approach is a mixture of the above two, that is to spread the risk between the state and the market.

One thing common to all these approaches is education. Education helps stimulate and invigorate the mind to create. Education helps the idea to be assimilated and applied. Thus, education is a critical factor in the development of inventions.

The question that arises now is how to finance the development and commercialization of new ideas. In most cases, the person who has the idea does not have the funds. Venture capital could be one way out. Typically a person looking for venture capital would be a beginning entrepreneur who is a

technocrat or scientist, with a vision but limited resources and without any assurance of the idea being a success. Filling this gap has made venture capital important all over the world. India, with one of the largest pools of scientists in the world and a huge market base, holds good potential for development and commercialization of inventions. What we need is someone to act as a catalyst in this process. There is a need to offering funds as a means to the end. A step in this direction has been the launching of venture capital funds by various financial institutions including Industrial Finance Corporation of India (IFCI), Industrial Credit and Investment Corporation of India (ICICI), Industrial Development Bank of India (IDBI) and State Bank of India (SBI). These have financed projects which could very well become world leaders, because some of the projects deal in products or processes which are not available in the world, let alone India. This includes Very Large Scale Integrated Circuit chips (VLSI) and permanent magnet alternators and brushless motors.

Even though new to India the concept of venture funds is finally taking roots. The concept took root in India when IFCI promoted Risk Capital and Technology Finance Corporation Limited (RCTC) providing need-based assistance on merits of each case including equity and commercial loans, both for development and commercialization stages. A formal venture capital fund was set up when ICICI promoted Technology Development and Information Company of India Limited (TDICI) in 1987. TDICI looks into the innovativeness of a product which may assure a high return to balance the risk involved. IDBI also has a venture capital fund scheme as a part of its technology department. The fund is primarily meant for high technology, small and medium-scale projects. IDBI and TDICI have got into funding a large number of projects in the research and development stage itself. Thus venture capitalists are acting as business developers by capturing promising ideas. The spectrum of venture capitalists including launching of new products, technology innovation leading to improvement in profitability and cost reduction, commercialization of indigenous material and products based on local resources for import substitution and setting up a commercial plant by scaling up process developed at the pilot plant.

To conclude, it may be said that in the ever changing world we live in, new ideas and inventions are our windows to the future. Unless inventions are commercialized over a period of time in large scale to achieve economies of scale, the results are likely to remain beyond the reach of the common man. For example, if penicillin had not been commercialized globally in a large scale, a huge population would have been deprived of its use. The prerequisite to achieving this objective is continued mutual cooperation and support between developing and developed countries. Developing and commercializing inventions becomes all the more important, because unless put to use in society and economy, they may die a premature death in the inventor's backyard or laboratory.

DEVELOPMENT AND COMMERCIALIZATION OF INVENTIONS (FINANCING, VENTURE CAPITAL, PATENTING, AND THE ROLE OF "ENTREPRENEURS")

by

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TABLE OF CONTENTS

INTRODUCTION

1. When discussing the role of patents or the legal protection of inventions in their effective marketing and commercialization, it may be useful at the outset to consider why technology assumes such importance in economic development. Many definitions of technology exist, but for the purposes of evaluating the economic significance of technology a useful general description of technology would be: "information or knowledge used in the production, commercialization and distribution of goods and services." Technology may thus be considered as a resource or input into production.

2. It is from its feature as a production input that technology derives its economic significance. The quality and cost of any product, of course, depend on the inputs which are required to produce it. Improvements in the quality of any of those inputs will be reflected either in the better quality or in the lower cost of the product. Thus, where the input is technology, an

advance in the technology may result in a product with more attractive performance characteristics, and, accordingly, a product which is more attractive for the consumer, hence, potentially more saleable for the producer. In such a case the technology and its improvement provide a means for expanding the producer's existing markets or creating new ones, and thus create opportunities for economic growth.

3. Alternatively, or in addition, to improving performance characteristics, a technological advance may increase productivity by facilitating greater efficiency in the use of other production inputs. The same amount of output is able to be produced from a reduced amount of input, and, thus, for a lower cost. If less inputs are required, the resources which are liberated by the use of a more efficient process may be put to other productive uses, thus allowing overall expansion of output and economic growth to occur.

4. The foregoing considerations have been confirmed by economists in a large number of studies seeking to assess the contribution of technological progress to economic growth. While the results of the studies differ, depending on the measure used for technology and the context to which the measure is applied, the general conclusion which emerges is that the contribution of technological progress to economic growth is significant, positive and high.[1]

5. In view of this contribution of technology, great importance has naturally been attached to the development of a sound technological base as an objective of government policy. A variety of instruments are, of course, available and used to foster this policy--including fiscal incentives to encourage research and development, government sponsorship of research and development, and preferential financing and venture capital policies for the commercialization of inventions and new technology. One of the oldest and most important of these instruments designed to encourage technological development is the patent system.

6. The patent system contributes to economic growth and development in creating the conditions for the marketing and commercialization of inventions in several ways:

(a) as an incentive to the creation of new technology which will result in, inter alia, new commercial products and opportunities;

(b) by providing an environment which facilitates the successful industrial application of inventions and new technology, and the legal framework which encourages investment, including from foreign countries;

(c) as a catalyzer for the commercialization of inventions and their transfer to productive use;

(d) as an instrument of commercial and industrial planning and strategy.

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1. For surveys of the relevant literature, reference may be made to F.H. Hahn and R.C.O. Matthews, "The Theory of Economic Growth: A Survey" (1964) Economic Journal, and A. Sen (ed.), Growth Economics (Baltimore, 1970).

7. Technology and inventions are components of the innovation process, which will transform inventions into marketable products and which is a most complex process and as such needs much specialized professional expertise and expert knowledge. The final phase of the innovation process is the commercialization phase which is crucial for the success of any invention and innovation.

8. The returns in terms of profit upon its commercialization are the ultimate (and eventually the most important) proof of the success of any invention or new product.

9. Some of these aspects of the patent system and the innovation process will now be considered in greater detail.

INCENTIVE TO THE CREATION, COMMERCIALIZATION AND MARKETING OF INVENTIONS AND NEW TECHNOLOGY

10. Technology--and inventions as a fundamental part of it--is, by nature, both a private good in creation and a public good in productive use or consumption. It is a private good insofar as its creation consumes both mental and physical resources which are thereby diverted from other production or consumption activities. Once technology becomes available in the form of information, however, it loses its characteristics as a private good. Unlike a tangible object, it can be used by many without loss to any one person, and without further investment in re-creating it for new users.

11. These characteristics of technology and invention create a dilemma. If all are free to use technology and inventions which have been created, who will be willing to bear the cost associated with their creation? One of the basic rationales of the patent system is to provide such an incentive for the creation of new technology and inventions. It does this by offering to inventors exclusive rights to exploit commercially patented inventions for a limited time in return for the disclosure of the invention to the public.

12. The exclusive rights to exploit the invention commercially permit the creator of the invention to work it without interference from imitators who have not incurred the investment in research and development which produced the invention. The inventor will thus have the opportunity to recover research and development costs through the competitive advantage which the exclusive rights to exploit the invention confer. The patent grant in this respect acts as an instrument of economic policy to stimulate further risk-taking in the investment of resources in the development of new products and technology.

13. Patents are granted on a technical and not on a commercial or market basis. However, the exclusive rights which are conferred by the patent relate to the commercial exploitation of the invention, and do not preclude another person from experimental work on the technological information contained in the patent specification. In other words, while the patent owner is protected against those who use, for commercial purposes, the same technology as is revealed in the disclosure of his invention in a patent claim, he is not protected against those who derive from his disclosed invention a perception of a market need which may be satisfied by the legitimate adaptation or improvement of his technology, or through the discovery of a different technical solution to satisfy the same market need.

14. The patent system stimulates invention and innovation through the accumulated pool of technological information contained in patent documents. More will be said below concerning the effective use of patent documentation as an aid to the commercialization, marketing and transfer of inventions and technology. For the present purposes, it may be noted that the technology disclosed in patent documentation may serve to stimulate ideas for further invention and innovation.

15. Foreign investment has been widely recognized as an important means whereby a country may develop the resource basis necessary for technological development. A great many factors are relevant to the encouragement of flows of foreign investment, such as the fiscal and general regulatory system of the host country, policies on the extent of cooperation required with local enterprises, and other economic and political considerations. However, one important other factor which is relevant to the encouragement of foreign investment is the existence of a patent system. It has been said, in contrast, that the maintenance of a patent system has relatively little impact on foreign investment decisions, which are said to be influenced more by market considerations and the institutional environment of the host country. The importance of the patent system as a factor influencing foreign investment must be appreciated in the perspective of large variety factors which are relevant to the encouragement of flows of foreign investment.

16. Within such an overall perspective, it may be said that the provision of a sound patent system is certainly a factor which is taken into consideration in the course of formulating investment decisions, and that a patent system thus provides an institutional framework which is conducive to encouragement of investment, including foreign investment. The strength of patents as a factor influencing investment decisions also depends very much on the field in which investment takes place. If an investment is contemplated in a technology-intensive field in which competition is strong, then the presence of a patent system will certainly be a very relevant influence in the formulation of the investment decision.

17. One criticism which is frequently voiced in relation to the affirmation that the patent system serves to stimulate indigenous invention and innovation in developing countries is based on the argument that the majority of patents granted in developing countries are granted to foreigners.

18. The division between developing countries and developed countries in relation to the proportion of patents which are granted to foreigners is not at all clear-cut. In Australia and Canada, for example, a higher percentage of patents were granted to foreigners than in Bangladesh, India and the Republic of Korea. In a similar vein, it may be seen that the degree of indigenous invention as manifested in grants of patents was higher in India than in Australia, Canada and Switzerland, and not substantially different there from the United Kingdom.

19. However, dominance of national markets by foreign technology may not be attributed to the patent system alone. Statistics which show that the number of patents granted to residents is low are more a reflection of the developing state of the technological and scientific capabilities of the country concerned than a comment on the ineffectiveness of the patent system in providing an incentive to invention and innovation. Such dominance cannot be successfully defeated by refusing patent protection since, in any event, patent protection is indispensable for the establishment of an innovative domestic industry.

20. The patent system must be understood in this context as a policy instrument which encourages developing indigenous technological capabilities by providing an incentive to local inventors, rather than a policy instrument which, if adopted, will immediately effect a transformation in the level of technological sophistication in the relevant country. In fact, it represents a strong shield for the development of innovative domestic industry however small it may be at the moment. The patent system does not constitute an instant remedy, but rather a long-term infrastructure investment in development of the national market. Without any patent system, local inventors, entrepreneurs and companies would have no effective protection against the imitation of their inventions, and less incentive to invest in the development and strengthening of their technological capacities. It might therefore be expected that the number of inventions produced by local inventors would be even less in the absence of a patent system.

INFORMATION ASPECTS OF THE PATENT SYSTEM AND MARKETING AND COMMERCIALIZATION OF INVENTIONS

21. Historically, patent protection was introduced as an economic policy instrument through which foreign skills and expertise could be attracted to a domestic economy by the grant of exclusive rights to work a particular skill or trade which was not present, or was underdeveloped, in the domestic economy.[2] The modern patent system contributes to the commercialization, marketing and transfer of technology in several main ways.

22. The patent system plays the important role in the process of matching technology suppliers and recipients. In addition to the valuable technological information, a published patent document contains details of the names and addresses of the applicant, patentee and inventor, and thus provides a means whereby the owners of rights in relation to technology may be located.

23. The accumulated store of information which is contained and classified in patent documentation constitutes the single most valuable and comprehensive source of technological information available in the world today. As a source of technology and commercial and legal information, patent documentation has a number of distinct advantages:

(a) the technology contained in patent documents is, by definition, new industrial technology. It is a condition of the grant of a patent that the invention for which the patent is claimed be new, workable and capable of industrial application;

(b) patent documentation contains both a historical record of the evolution of a particular technical field, and a record of the most recent advances in that field;

(c) patent documentation also contains an extensive range of technological information which has not been published elsewhere. Such technological information would appear in traditional

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2. See F. Beier and J. Straus, "The Patent System and Its Information Function--Yesterday and Today" (1977) 8 International Review of Industrial Property and Copyright 387-406.

information sources much later after the publication of the application or the patent. Much of the technical information which is made accessible through patent documentation would not be attractive as propositions for commercial publishing, either because it concerns inventions in highly specialized fields, or because its voluminous detail would make the costs of commercial publication prohibitively high;

(d) a further advantage of patent documentation as a source of technology is that it is usually published in a uniform structure and form, which typically includes a summary of the invention, a description of the invention and how it differs from the prior art, and, of course claims, that define the scope of the invention. Very often it contains also an abstract of the invention to facilitate easy reference;

(e) additionally, patent documentation is usually classified in such a way as to enable a searcher to retrieve documents belonging to any given field of technology, thus facilitating comprehensive access to the sources of technology in that field;

(f) patent applications and patents contain the full names and addresses of the inventors, the applicants and the patent owners (patentees), and thus provide a means for identification of the owners of rights in relation to the technology;

(g) patent documents provide information on the state of protection of a given technology or invention.

24. Analyzing patent applications or patents for the same invention in different countries will permit conclusions concerning the commercial interests of the patent owner.

25. The aforementioned advantages characterize the information which is available through the patent system as an extremely valuable and comprehensive source of commercial and technological information, which can be used directly for scientific and experimental purposes and as a basis for stimulating the adaptation and improvement of the technology described in patent documents immediately after its publication, provided the user has the necessary basic and specialized knowledge.

26. It should be noted that the information contained in patent documentation provides merely the skeleton of a particular technology, and needs to be supplemented from other sources in order to represent a functional body of technology. In every case the raw source of technology disclosed in a patent specification is supplemented after the grant of a patent by know-how derived from the accumulated experience of the use of the invention.

27. The framework of the patent system also provides a necessary element of certainty for a technology transfer transaction. If a potential technology recipient were located in a country which did not maintain a patent system, the supplier of the technology would need to rely on purely contractual arrangements seeking to guarantee non-disclosure and use of the invention by third parties. Such arrangements establish an element of commercial risk for technology suppliers which is more pronounced than in circumstances where the

transfer transaction can be linked to a patented invention guaranteeing protection against exploitation by third parties.

28. The existence of a patent also introduces another measure of certainty to the commercial transfer transaction by enabling the potential recipient of the technology to sight the essence of the technology which he is wishing to acquire. In the absence of a patent, such initial sightings of the technology which it is proposed to transfer must take place through disclosures under secrecy and confidentiality agreements, which can again introduce an element of commercial risk of the leakage of the technology to third parties, thus undermining both the value of the technology from the point of view of the supplier, and the value of the technology for which the recipient will be paying.

COMMERCIAL AND INDUSTRIAL PLANNING AND STRATEGY

29. In the highly competitive environment of international trade, increasing importance is being placed on planning and forecasting, and the development of appropriate commercial and industrial strategies on the part of individual enterprises, industrial groupings, and even countries. Such strategic planning is an increasingly important part of the successful implementation of the product and marketing policy of individual companies, and of the establishment and development of a technological base which is appropriate to the capacities and opportunities of the relevant country.

30. Recently, increasing attention and importance have been given to the role of the patent system as an analytical instrument for such industrial planning and decision-making. Two main uses of the patent system may be mentioned in this regard.

31. As already mentioned, the effective searching of patent documentation can indicate the state of the art which exists in relation to any particular field of technology, which will be of particular importance to the individual enterprise. Awareness of the state of the art in a particular technical field can avoid duplication in research work by indicating that the desired technology already exists; can provide ideas for further improvements; and can give an insight into the technological activities of competitors and, by reference to the countries in which patents have been taken out, the marketing strategies of competitors. A state-of-the-art search can also identify newly developing areas of technology in which future activity should be monitored.

32. Another area in which the patent system may be used as an instrument of industrial planning is the statistical aggregation of patenting activity as revealed through published patent documents. Since the degree of patenting activity provides an index of the degree of technological activity in a given technical field, the statistical analysis of patent documentation can indicate which countries or companies are active in various fields, in which industries technology is moving at a rapid pace and in which the technology is stable, and which enterprises are active in particular technical fields. Such analyses provide a means of forecasting future industrial developments, identifying areas in which market demand is increasing, monitoring general technological progress, and testing the soundness of policy and investment decisions.

PRACTICAL QUESTIONS RELATING TO MARKETING AND COMMERCIALIZATION OF INVENTIONS

33. If we look at the innovation process in its complexity we can realize that it consists basically of four overlaping and interrelated main phases: the idea generation and conception phase, the development and design phase, the prototype and pre-production phase, and the production and commercialization phase.

34. The crucial point in the innovation process is the marketing and commercialization stage, when the invention or the new product or process based on it will meet the test of the market. It is only when it is accepted on the market by the consumers and users that the invention or new product will begin to generate income which will compensate for the investment made and eventually generate also some profit.

35. The returns in terms of profit upon its commercialization are the ultimate (and eventually the most important) proof of the success of any invention or new product.

36. The innovation process is not a linear process since, as already mentioned, its different components overlap and interact in a considerable degree. Thus the commercialization and marketing of an invention could be initiated at a very early stage of its development, e.g. already during the idea generation and conception phase. However, it is not advisable to begin commercialization at such an early stage and at least not before having filed a patent application. The price offered for such an inventive concept would be very low, regardless of its ingenuity and market potential, since a lot more of work will have to be done before the invention may be used in practice and could generate any income.

37. An illustration of this is the invention of xerography, which is the technical basis of the copying machines. It took the Battelle Northwest Laboratories more than 10 years of R & D work and several hundred thousand dollars of investment to develop a marketable copier after the invention was made and its feasibility proven. And only then began the marketing based on the vast distribution network and experience of the Rank organization.

38. A common mistake of many inventors is to try to sell their invention without taking the necessary steps to at least obtain legal protection and to develop the inventive concept into something more tangible, e.g. to produce a working prototype.

39. One should always remember that from the point of view of marketing and commercialization inventions have many properties in common with any other commodity or product, the main difference being that unlike material goods, inventions can be used simultaneously by several persons and hence they can be sold or licensed to several persons.

40. Inventors and all those involved in marketing inventions and innovations should not forget that only a very small percentage (5 to 7%) of all inventions for which patents have been granted succeed in being commercialized. The great percentage of failure is usually not due to the quality of the invention, but rather the result of the influence of other factors, such as, for example, the high cost of investment for a relatively small effect, need of additional R & D work, the manufacturing and technological environment are not yet ripe for such invention, no real market

need. But the history teaches us that that will not stop creative people from inventing and trying to commercialize their inventions. Inventors are usually confident that their inventions will sell.

41. Marketing strategies will largely depend on the kind of invention and the field of technology to which it is related. They will be different for a mass product and for an invention in a specialized field, applicable only in the production of a few manufacturers. The market environment, the customs, the buying capacity of people in the area will to a large extent define the methods and approaches.

42. Commercialization of inventions is a most complex process and inventors are advised to seek as much as possible professional expert assistance when they are involved in that process, or in other words, inventors should be aware that the marketing and commercialization of inventions in a highly competitive market needs a professional approach and a lot of professional expertise in order to have chances of success.

43. There exist many publications that teach strategies and techniques on how to sell and commercialize products, but all of them always underline that there can be no fixed rule on how to commercialize or market a product, although certain guidelines are basic and important to remember. The same applies even more to inventions, which by definition are not standard products.

44. The following story is an excellent illustration of what can happen in reality. One American company sent some salesmen to a remote part of Africa to explore the market posibility for shoes. The first salesman reported to his company that shoes will be saleable in that part of Africa because nobody wears shoes. The second salesman sent by the company to follow up the survey a few months later reported that "Shoes will not be saleable here because nobody wears shoes." This is an example of to what extent conclusions may differ under the same circumstances.

45. Successful marketing of inventions and technology means to marry a new technology to a real existing need. It demands an extensive collaboration and cooperation between three groups of people: those who create technology, those who use technology, and those who create markets.

46. From the point of view of the inventor or invention owner, the main ways for commercializing inventions are basically to start his own manufacturing and marketing the product based on the invention, to license the rights in the invention, or to sell the patent rights. The decision will depend on a variety of factors, among which often the cost and benefits analysis will have the basic influence.

47. The income that an invention will generate depends directly on the investment made for its development and marketing: Highest return may be expected when the inventor decides to start his own production based on the invention, but this way will require also the lagrest investment; the return for the inventor will be lower when he decides to license or even to sell his patent rights at an early stage of development of his invention. Each individual case should be analyzed and evaluated accordingly, taking into account the nature and properties of the invention, the needs, conditions and potential of the market, the resources available, and last, but not least, the willingness of the inventor to cooperate in further development of the invention.

48. Well prepared business plans and convincing prototypes are indispensable for attracting investors, manufacturers and potential users.

49. Patent protection, if available and strong enough, can be a very powerful tool in the commercialization process, in particular on foreign markets.

50. It is always recommended to begin commercialization on a local scale, close to the user and only upon success to embark on large-scale commercialization and marketing (including also for export in foreign countries).

51. The possible license partners or buyers for an invention may be approached in different manners, such as, inter alia, publicity, direct contacts with companies, contacts through chambers of commerce and industry and similar organizations, through professional or industrial associations, by participating in specialized exhibitions or by cooperating with an invention broker. The commercial success of an invention will depend largely on a reliable and dynamic partnership.

52. Today besides the figure of the creators of technology (inventors, R & D centers, universities) and the figure of the user of technology (the business community and the consumers), the finder/creator of markets (the entrepreneur) becomes more and more important in the commercialization and transfer process.

53. In some cases, in particular in developing countries, governmental agencies could act as brokers or promoters of inventions; however such institutions should not be a part of the administrative system, but should rather have an independent status.

54. To be efficient and useful to inventors such agencies (or innovation brokers) must offer, or have at least access to, the following services:

- technical and technological evaluation of inventions and innovative projects,
- economic evaluation and market studies (i.e. feasibility studies),
- legal advice and assistance,
- contacts with potential users,
- experience in business negotiations,
- contacts to mobilize and attract seed and start-up capital,
- assistance in patenting of inventions,
- assistance in publicity and public relation matters,
- advice and assistance in prototype manufacturing, etc.

55. In several countries, associations of inventors provide inventors with expert assistance on the different aspects of commercialization of inventions such as written information on general and specific business practice and ethics, information on the economic, financial and ethic aspects of commercialization, technological information, guidelines and other materials, including lists and addresses of experts in the various fields, patent practitioners, patent lawyers and invention brokers.

56. The Annex to this document contains a non-exhaustive checklist of suggestions and questions, which will facilitate taking decisions at the different stages of the marketing and commercialization of inventions and innovations.

ANNEX

Non-Exhaustive Checklist of Questions Which Will Facilitate Taking Decisions at the Different Stages of the Marketing and Commercialization of Inventions and Innovations

1. What is the state of development of the invention?

2. What is the state of legal protection of the invention--
   - no protection,
   - patent application filed in home country,
   - patent applications filed abroad (where),
   - patent granted in home country,
   - patents granted abroad (where),
   - patents abandoned (where)?

3. Who is handling the patent applications and other industrial property matters
   - in-house experts,
   - outside professionals?

4. How reliable is the patent protection in the home country and in the foreign countries, where applications have been filed or patents granted?

5. Who are the potential users of the invention--
   - manufacturing enterprises,
   - the general public,
   - specialized end users,
   - etc.?

6. What will be the economic effect and other benefits of using the invention for the future user or customer?

7. What financial resources (risk capital for this purpose, especially seed and start-up capital) are available for
   - developing the invention,
   - obtaining patent protection,
   - manufacturing and marketing of the products,
   - etc.?

8. Which way of commercialization will be chosen--
   - own manufacturing and marketing of the products,
   - granting an exclusive license to one partner,
   - granting several non-exclusive licenses,
   - selling the patent rights?

9. How big or how small to begin? What will be the cost of introducing a new product on the market? What is the minimum profitable volume of production?

10. Are there similar products in the market? If so, would they rather buy the competitor's products than yours because they are better in quality and more practical for the purpose than your invention? Who are the competitors and what is their market position?

11. Do you envisage using a trade mark?

12. Will the marketing be done with own resources or will it be commissioned to some professionals?

13. Will commercialization of the invention begin in the home country (local sales) or will it start at a larger scale in other countries (i.e. exporting the products of the invention)?

14. If participation in specialized exhibitions (including inventors' exhibitions) is envisaged, what are the objectives, who will be the clients to be met?

15. Why, how and when should inventors cooperate in the commercialization of inventions with commercial brokers?

TOPIC 6

THE TECHNOLOGICAL INNOVATION PROCESS; PATENT DOCUMENTATION AS A SOURCE OF TECHNOLOGICAL INFORMATION

by

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TABLE OF CONTENTS

2. Public diffusion of patent information in Japan
   (1) Developments in patent information services
   (2) Distribution of patent information services
   (3) Innovation of information service media
   (4) The JPO's patent information dissemination policy

CONCLUSION

1. Utility of patent information for technological innovation

2. Needs for extensive utilization of patent information

ANNEXES Figures 1 to 35

* * * * *

INTRODUCTION

Japanese modern industry which originated with the Meiji era (1868-1912) has been well developed and ranks foremost among Western industrialized nations after a complex process of destruction in World War II, postwar rehabilitation, followed by rapid growth and maturity. In particular, Japanese industry has achieved substantial development through aggressive introduction and assimilation of advanced Western technologies in the early days of the Meiji era, followed by their mastery and improvement in the post-World War II period. Labor productivity in Japan improved an average 4.44% per year in prewar years, with 65% stemming from the merit of technological innovation. This compares to an annual growth of 9.53% during the postwar years, with 69% stemming from technological innovation. Such industrial achievements derived from a well-established patent administration system and the technological innovations achieved by effective utilization of patent information covering useful proprietary know-how. (See Figure 1.)

Technological Innovation Spurred by Patent Information

The patent administration system grants an inventor an exclusive right to implement the patented invention for a specified period of time to assure that the inventor may recoup his investments in research and development under more favorable conditions. The patent administration system is instrumental in motivating invention through legal protection of patent rights. Under the patent administration system, inventions are disclosed to the public in the form of patent specifications covering the technical details involved. This system has also given rise to "alternative inventions" which provide similar technological functions, "innovative inventions" and "complementary inventions" which improve or reinforce original inventions. These "derivative" inventions disclosed and protected under the patent administration system can increase social benefits and contribute to national and international economic growth similar to original or basic inventions. Additionally, such patent protection and disclosure can help beget new

inventions and foster scaling up of reproduction of inventions and technological innovation.

I. EXAMPLES OF TECHNOLOGICAL INNOVATION AND PATENT INFORMATION IN JAPAN

1. Technological Developments in Early Pre-Patent Ages

During the Edo period (1603-1868) which preceded the Meiji era (1868-1912), the government banned foreign trade under a national isolation policy, including production of new materials or equipment, in order to maintain an orderly and stabilized social system. (See Figure 2.)

In 1721, the government issued an official decree to prohibit manufacture of any new products including clothing, tools, utensils, books, goods, confectionery, etc. During that period, new techniques, no matter how useful, were kept secret as personal property and banned from public disclosure by the government. In the Edo period, the "Secrecy Act and Regulation" were applied most rigidly to castle construction techniques for military and strategic reasons. To achieve this end, construction tools and equipment were customarily destroyed and scrapped concurrently with the completion of the castle involved. Likewise, stone, lumber, iron and steel materials were buried underground to assure confidentiality of strategic information. It is reported that engineers and workers privy to such classified information were detained by the local government after castle construction and permission denied to leave their place of residence only to preclude the possibility of leakage of secrets to third parties. Production techiques of swords, chinaware, etc. were also kept secret and personally bequeathed from father to son or from master to disciple. During that period, technological development stagnated, resulting in Japan being outdistanced by Western industrialized nations in modern technological proficiency.

The Meiji government which took the helm of the nation after the Tokugawa feudal regime retired in 1868 was quick to admit the notable difference in industrial maturity between Japan and advanced Western countries. Awareness of such handicap by the leaders of Japan drove the nation to diligently strive to catch up with Western predecessors to the best of its effort and ability. Initially, the Meiji government launched a new policy to develop Japan into a rich and powerful country, and encourage commerce and industry. However, the virtual absence of a patenting system in the early days of the Meiji era hampered smooth development of modern technologies. (See Figure 3.)

(1) Mr. Gaun who invented a Japanese-style spinning machine in 1875 displayed his new product in an exposition. His exhibit earned the best prize, but was cunningly copied by his trade competitors prior to industrialization of his invention. These competitors earned abundant profits on his invention. Thereafter, he continued to dedicate himself to further inventions, only to be copied by his competitors who slyly exploited his technical resources in the same manner as happened with the spinning machine. The enormous expenses he incurred from his invention activities plunged him into heavy debt and drove him into circumstances where he was even unable to afford to pay off his living expenses. (See Figure 4.)

(2) In 1878, Mr. Isozaki from Okayama Pref. invented "Hanamushiro," a strawmat made of a plant called rush, and a machine for its weaving. Later, these products found extensive outlets in the European market. Mr. Isozaki only employed his relatives and physically handicapped (blind or deaf) persons for the commercial production of his newly invented products to prevent possible leakage of proprietary technical information. The Governor of Okayama Pref. took pity on his position and offered support. The Governor extraordinarily permitted him to employ prisoners in Okayama prefectural prisons for production to preserve the secrecy of his invention. In this way, the inventor barely managed to recoup his investment for his invention. (See Figure 5.)

2. Institution of Patent Administration System in Japan

The basis of a patent administration system was established in Japan when a patent office (currently, the Japanese Patent Office) was established on April 18, 1885, concurrently with the promulgation of the Patent Monopoly Act. The patent administration system was committed to safeguarding inventors' exclusive rights, thus relieving them of wasteful efforts to conserve the secrecy of their inventions. (See Figure 6.)

Publication of Patent Gazette

Three years after the patenting system was instituted, the Patent Act was enforced in 1888. This paved the way for public disclosure of inventions, including release of patent specifications (Nos. 1 through 50). (See Figure 7.)

Also, the 1921 Amendments to the Patent Act opened an avenue to institution of a system to allow public disclosure of examined patent applications to provide third parties with opportunities for filing their opposition prior to patent approval and registration.

In addition, the 1971 partial amendments to the Act paved the way for introduction of a system which allows public disclosure of unexamined patent applications after a lapse of 18 months following the date an application was filed. (See Figure 8.)

From the latter half of the 1970s, the number of invention and utility model applications has been rapidly increasing, reflecting improvements in technological standards, massive increase in R & D investments, and growing interest in the protection of industrial property rights as part of corporate strategies. Such applications increased from 341,000 in 1977 to 543,000 in 1987, a 1.6-fold increase during a decade. This compares to a 1.2-fold increase in the United States of America and 0.7-fold increase in Germany. As a result Japan accounts for more than 40% of the entire world in terms of the number of patent applications filed for invention and utility model rights. (See Figures 9 and 10.)

In particular in 1987, applications notably increased in the field of high technology. For instance, applications related to office automation (OA) technology numbered 642, computers, 533, and semiconductors, 382, far in excess of the average of 162 (1975 = 100) in 1987. (See Figure 11.)

These applications were disclosed as KOKOKU KOHO--publication of examined patent applications--and KOKAI KOHO--publication of unexamined patent applications--covering useful patent information on inventions and utility models required for technological innovation.

3. Research and Development Supported by Patent Information

Patent gazettes released by different countries of the world provide the latest technological information for international use, occasionally imparting information on the birth of new, innovative technologies. In particular, patent gazettes released by advanced industrialized nations provide the current developments in R & D and the major trends of production technology. They can even provide the basis for prediction of how economy and industry will stand in the future. Accordingly, patent documents find extensive applications by corporations in research and development, corporate planning, patent administration, technology transfer, marketing, purchasing, strategic operations abroad, etc. Especially, patent information is essential for R & D activities. (See Figure 12.)

The following pages present successful cases of R & D supported by patent information.

(1) Video Tape (S Corporation)

While a patent specialist of S Corp. Central Research Institute was examining reference patent information for a specific purpose, he happened to discover, by sheer chance, U.S. Du Pont's patent specifications covering application of chrome dioxide to video tape. Impressed by the fact that Du Pont was using chrome dioxide, he informed S Corp.'s R & D Division of his new discovery. Inspired by the Du Pont patent information, S Corp. decided to use chrome oxide on video tape and started off with a full-fledged R & D project, and marvelously succeeded in subsequently commercializing its video tape.

(2) Invention of a Process for Aniline (M Petrochemical Industries, Ltd.)

A patent specialist of M Petrochemical who was examining the 1967 publication of examined patent applications covering a process for manufacturing phenol-based aniline, discovered a patent application filed by H Inc. By then, M Petrochemical had been engaged in a mass production project for phenol. M's R & D Division simulated this invention and then, proceeded to technology transfer, industrialization tests and plant construction. The plant was commissioned to service in July 1970.

(3) Quick Dustor (T Filter Industries, Ltd.)

Years before, the president of T Filter had joined a major machinery manufacturer as a sales representative following university. He had at that time accompanied the company's president on overseas trips for visiting industrial fairs and expositions, where pollution-control filters caught his attention. After returning to Japan, he established his own business as a filter manufacturer. He collected an extensive variety of technical information on filters from brochures, newspapers,

magazines, patent specifications, etc. Making effective use of such information, he succeeded in developing a self-cleaning-type filter, the first best-seller produced by his company. One day, a U.S. company approached him for transfer of his filter technology, based on their findings from examining international patent disclosures. He was surprised and overjoyed by the value and far-reaching effects of patent information.

(4) Paddle Dryer (N Machinery Works, Ltd.)

N Works, a small specialized manufacturer of dust processors, is highly R & D-oriented. The company worked on development of a series of new products in rapid turn, i.e., quick dryer, paddle dryer, melt mixer, etc. The company has been involved in intensive investigation into public patent information as a guide to the current trend of industrial technology and as one of the sources for new ideas of invention. As an example, the successful development of their paddle dryer was the outcome of their perusal of the patent information available for public review at the Japanese Patent Office. In fact, the company's engineers visited the JPO day in and day out, in quest of target technical information.

(5) Invention of a Process for Urethane Wainscot (I Industrial Corporation, Ltd.)

Incorporated in 1970 as a venture enterprise, the company specializes in the manufacture of construction materials, such as incombustible exterior urethane wainscots. Aware that the basic patent rights in urethane production held by a foreign enterprise would expire in 1971, thus leaving anyone free to use the patent thereafter, the president decided to incorporate the company. After his company gained a breakthrough into new technologies relating to the production of outer walls, the company patented over 500 inventions and utility models as of 1984. The company purchases periodicals carrying bibliographic descriptions from commercial booksellers and extracts potentially useful patent information. In addition, the company acquires proprietary technical information through specialized information services as tools of R & D.

4. Increasing Technological Innovation and Roles of Patent Information

The current wave of technological innovation is so intense that it is beginning to transform industrial, social and political structures. Successful development of new technologies is a prime mover of economic and industrial growth and of the prosperity of private and public organizations. Commonly, an R & D project involves a complex and extensive process of research in basic and applied technologies, prototyping, trial run and commercial operation.

Now, the following paragraphs present the current picture of invention and technological innovation aided by proprietary technical information available under the current patent administration system, taking nylon and semiconductors--transistors and ICs--and color TV CRT production technologies as examples.

(1) Nylon

In 1938, Du Pont announced the successful industrialization of a process for nylon, representing a long-cherished synthetic fiber. The news not only frightened the Japanese silk industry which had lived on mass exports of silk products since the Meiji era, but also the chemical industry. Among numerous local businesses, M trading company was the first to react to Du Pont's release of nylon.

Within just two months following the release of the U.S. nylon patent on September 20, 1938, M trading company was quick to forward copies of the relevant patent specifications and sample nylon yarns to Japan. In February of the following year, 1939, Professor Sakurada of the K University succeeded in analyzing the specific behavior and chemical properties of the nylon fiber.

He was followed by Professor Hoshino of T Institute of Technology in March of the same year. Japanese researchers, who were seeking a process for nylon in ways that did not infringe Du Pont's patent rights, directed their attention to the Italian patent No. 373977 (Swedish patent No. 99037). This patent related to polymerization of caprolactam, and carried descriptions suggestive of a process for nylon 6. In contrast, Du Pont's patent specifications did not cover descriptions of nylon 6. Knowing that caprolactam could be polymerized, T Rayon started immediate research on and successfully developed nylon 6, and entered commercial production of nylon 6 at the rate of five kgs per day.

The war damage and defeat in World War II eroded the Japanese nylon industry temporarily, but the prewar asset of nylon R & D aided by patent information helped the quick recovery of production technology and facilities, and played a central role in shifting the mainstream of the Japanese textile industry from natural to manmade fibers.

(2) Semiconductor Technology

A stream of new technologies resulted after the Bell Laboratories invented the transistor in 1948. Japan, striving to stay close to the U.S., lost little time in starting research in semiconductor technology. In fact a number of industrial companies in Japan had started mass production of transistors by 1958, but since most of the basic patents had been licensed from foreign enterprises, the Japanese semiconductor industry had no alternative but to resort to transfer of technology through license agreements, etc. Practically, the Japanese semiconductor industry imported silicon planer semiconductor technology in 1963, planer semiconductor IC technology in 1966 and integrated circuit technology in 1967 from U.S. semiconductor manufacturers.

Transistor

The first transistor was the "point-contact" type, as invented by the Bell Laboratories. Inspired by this epochal invention, William Shockley invented the "junction" transistor with high utility. With respect to KOKOKU and KOKAI applications filed with regard to alloying, diffusion and gas phase

epitaxial growth technology which represents junction forming technology of "junction" transistor, we find that foreign patent disclosure precedes Japanese counterparts in the beginning, but the latter gradually increases over the former as time passes, indicating that Japanese have skill in applied technology. During this period, most of the major inventions of semiconductors were made by foreign corporations, WE, RCA Corporation, Siemens, Fairchild, GE, etc. (See Figures 13 and 14.)

In 1958, Japanese semiconductor manufactures established the Japan Electronics Development Association, which investigated manufacturing methods, characteristics and patents of foreign transitor products.

Integrated Circuit

The integrated circuit (IC) was developed in the course of U.S. research for defense and space technologies. Texas Instruments and Fairchild are known as major patentees. In respect of current developments in KOKOKU and KOKAI applications covering IC production technology, we note that foreign patent disclosures assumed a much higher proportion in 1959 and 1960, but Japanese application disclosure is becoming more frequent from 1965 onwards, the year commercial-scale IC production started.

Japanese computer industry is overtaking the U.S. and other international counterparts more in IC than in transitor in terms of R & D and commercial production. For instance, Japan is beginning to outdistance foreign countries in terms of the number of applications filed, and this mirrors a fair progress in Japanese self-development of high technologies during this period. (See Figure 15.)

In 1965, the Japan Electronics Development Association organized a Committee on Micro Electronic Circuits, which collected the latest information, including domestic and foreign patent documents, analyzed technical trends, published abstracts of documents and distributed them to manufacturers.

With respect to IC lead frame, resin and glass sealant and ceramic containers, Japanese inventions are being made concurrently or ahead of foreign inventions. In regard to IC application technology, Japan ranks equal to Western technology. (See Figure 16.)

LSI Technology

Concerning large-scale integration technology which packs several thousands or several tens of thousands of circuits in a single chip, Japan shows even more exceptional progress in semiconductor technology. With respect to patent applications for semiconductors, foreign applications have been losing share with regard to Japanese applications in recent years. (See Figure 17.)

In an early period, Japan was far inferior to Western industrialized nations in semiconductor R & D technology, but it has been able to overtake those nations through self-development of new technologies, making effective use of patent information.

(3) TV Technology

Technology Transfer

Japanese prewar TV technology was quite high as evidenced by the invention of Mr. Takayanagi, but it suffered a setback during World War II. Following the end of the war, Japan lagged approximately 10 years behind the United States of America on TV technology. Immediately upon termination of the war, Japan set about research on TV technology and started monochrome commercial TV broadcasting in 1953 and color TV broadcasting in 1960, although Japan had to import most of the major TV components. (See Figure 18.)

After starting commercial services, Japan significantly scaled up monochrome and color TV production, but was pressured by payment of a large amount of royalties since Japan depended heavily on technology transfer from abroad. (See Figures 19 and 20.)

Technological Development in Japan

Patent applications covering inventions and utility models relating to TV technology increased in Japan during the 1965-70 period. With respect to publication of examined patent applications for color TV CRTs, inventions and utility models increased during the latter half of the 1960s. This is ascribed to the successful self-development of black matrix fluorescent screen and monolithic electron gun for color TV receivers in Japan. (See Figure 21.)

In 1970, Japan exported some one million color TV receivers worth some Y58 billion, of which 90% were consigned to the United States. (See Figures 22 and 23.)

During this period, the U.S. Z Corp. requested Japanese manufacturers to sign a patent license agreement on the black matrix tube, but the Japanese manufacturer T Corp., which had implemented thorough investigations of the U.S. patent information, claimed that its self-developed blackstripe tube did not infringe the U.S. patent. Ultimately, T Corp. won a lawsuit over the case.

Thus Japan was able to achieve phenomenal technological innovation, based on patent information in the field of TV receiver technology, once a weakness of Japanese industry.

II. ESTABLISHMENT OF A SYSTEM TO UTILIZE AND DIFFUSE PATENT INFORMATION

1. Utilization of Patent Information in Corporations

Regarding the utilization of patent information, the chairman of U.S. Company made impressive remarks, saying:

"Enterprises are the orchards of inventions. At the moment, the world's leading enterprises are bent on raising affluent fruits on the trees growing up in their own orchards. However, diversified needs required of contemporary enterprises could not be covered merely by raising these fruit-bearing trees. We have ever been eager to seek after seeds and saplings of new technologies

in every corner of the earth. Once we get access to quality seeds or seedlings, we should lose no time in transplanting them into the company orchard and fertilize them for forced culture in an optimized environment. The patent information forms one of the important means to enable us to locate such seeds and saplings."

Reportedly, new scientific and technological information accrued during a year totals some five million items. Of such information, patent information accounts for about 20% (one million items). Thus patent information occupies a high proportion of overall useful information. (See Figure 24.)

Moreover, from the viewpoint of quality, patent information provides the following features.

Specifically, patent information

(i) covers every and all fields of technology,

(ii) issues in standard format and specifications,

(iii) offers source information on the latest technologies,

(iv) provides complete bibliographic information, such as applicants, inventors, etc.,

(v) provides systematic classification for easy retrieval,

(vi) provides compilation of a master database for efficient data access,

(vii) imparts proprietary technical information. (See Figures 25 and 26.)

Extensive questionnaires have been addressed to business establishments to determine what type of technical information they depend on when searching for associated or similar technologies during the research phase and also to identify from which information they discovered associated or similar technical information.

The survey revealed that domestic and international patent gazettes account for more than a 10% rate of utilization, which evidences that patent information provides the primary source of useful technological information. The survey also disclosed that corporations were able to discover associated or similar technologies more from patent gazettes, which implies that these gazettes provide the most reliable source of information meeting their specific needs and purpose. The survey confirmed extensive use of patent information by many companies.

We also investigated why and how these companies use patent information in their R & D phase, and found out that most companies use patent information as a yardstick of the current trend and developments of R & D being carried out by their competitors as reference information. (See Figure 27.)

In view of the fact that the outcome of competitors' technological research and development are unexceptionally reflected in their filed patent applications, patent information provides a highly dependable source of information covering the activities of their competitors.

Second, average companies depend on their competitors' research activities as reference information for their own R & D plans. Especially, they are using patent information to preclude the possibility of duplicate research. In addition to these activities, extensive application has been made of patent information as a tool of forecasting potential technological developments in the future, the source of new inventions and ideas, and as reference information for industrialization of their inventions.

Acquisition and Processing of Patent Information

Enterprises can obtain patent information from two major sources. A primary source is patent applications covering inventions and utility models (KOKOKU KOHO and KOKAI KOHO, namely publication of examined and unexamined patent applications), and a secondary source of information is modifications to original applications.

Major companies in Japan obtain such information from the primary source of supply. In the case of N Corporation, for instance, the Patent Administration Division first screens patent gazettes to be investigated and then forwards them to the R & D Division and the Engineering Division for technical review. These gazettes are returned to the Patent Administration Division for further checking of details. Gazettes of particular importance are carried in the monthly investigation report as reference information for the R & D and Engineering Divisions. After these procedures, patent gazettes are filed by applicant, sometimes by a card filing system.

Companies which cannot afford to resort to such an approach purchase patent summaries or excerpts, indexes and listings of tables of contents, microfilmed patent information, etc., including purchase of patent specifications with regard to gazettes of particular importance. In Japan, many commercial information providers engage in patent information services.

Utilization of Database

Currently available in Japan are approximately 10 patent database management systems. (See Figure 28.)

The PATOLIS system from the Japan Patent Information Organization (JAPIO) offers more complete patent information services. This system has been used by most of the major corporations in Japan.

With respect to foreign patent databases, CLAIMS covering U.S. patent applications and INPADOC covering international applications are often used in Japan.

Typical Corporate Patent Information Management Systems

Recently, computers are becoming increasingly popular with companies, and quite a few corporations are operating private patent information management systems. For instance, IS Company operates four patent information management systems through the Patent Administration Division, including:

(i) patent gazette acquisition and utilization system,

(ii) online patent information retrieval system,

(iii) private computer-aided patent administration system,

(iv) comprehensive investigation and analysis system.

Of these, the private computer-aided patent administration system can create details of annual applications filed, a variety of patent maps, etc., in addition to management of patent applications filed. Such patent information management systems are common to most of the major corporations in Japan.

2. Public Diffusion of Patent Information in Japan

(1) Developments in Patent Information Services

In Japan, patent information service is increasing in volume and quality, but no field investigations have yet been made into the details of services being offered. According to the JPO's 1987 survey, Japanese corporations allocate approximately 10% of patent administration expenses, or 0.4% of total R & D expenditure to patent information services. (See Figure 29.)

(2) Distribution of Patent Information Services

In Japan, patent information service is offered by the Library of the Japanese Patent Office and its regional patent librairies where public review of patent gazettes and reference documents is available. Annually, the Library receives 110,000 visitors and the regional librairies, 170,000. The JPO's Library and regional libraries at Osaka, Sapporo, Fukuoka, Sendai, Hiroshima, Takamatsu and Nagoya offer comprehensive online database service via high-speed digital communication lines. This service receives some 1.3 million calls annually. (See Figure 30.)

Commercial pay service is offered by JPO via JAPIO, which deals with patent gazettes, abstracts, excerpts, PATOLIS online service and electronic data services using optical discs, CD-ROMs, magnetic tapes, etc.

In Japan, there are approximately 50 commercial patent information providers, which purchase a variety of patent documents from JAPIO and overseas suppliers and redistribute them to local clients after duplicating or reprocessing.

JAPIO's PATOLIS system, overseas online service, is also becoming popular in Japan.

(3) Innovation of Information Service Media

This paper provides a breakdown of services by type of media involved. The sale and photocopying of patent gazettes and the sale and editing of

abstracts and excerpts are paper-based services. Optical disc, CD-ROM and magnetic tape services and online database services are offered by electronic media. (See Figures 31, 32 and 33.)

In Japan, 55% of the gross patent services has been earned by electronic media, with the mainstream of the revenue shifting from paper to electronic media.

Back in 1970 patent gazettes had the dominant share as the medium of patent information. Abstracts and online services were also used in small quantities.

In the future, there is a prospect for rapid diffusion of online services, electronic media services using CD-ROM, etc. In particular, miniaturized electronic media such as CD-ROMs, can partially substitute (a) paper as media--by prompt printout of desired information as required--and (b) online databases as PC-retrievable databases.

The JPO is planning to publish official gazettes in the form of CD-ROM in 1993.

(4) The JPO's Patent Information Dissemination Policy

The JPO expects to carry out extensive distribution of patent information to users through the public and the private service divisions. Each organization is expected to perform the following functions (see Figure 34):

- JPO will issue patent gazettes and related documents and assure that they are available for public review.

- The public service division will engage in the sale of gazettes, online and offline information services, support of regional library service to assure public review and development of English database for overseas patent services.

- The private service division will engage in patent information services by processing and duplicating patent information offered from JPO via the public service division.

The JPO is planning to distribute Japanese patent information to overseas interested organizations in a nonexclusive manner to ensure

(i) international diffusion of technology and contribution to the international society,

(ii) protection of inventors and avoidance of international conflicts, and

(iii) promotion of international exchange of information.

International cooperation through WIPO should play a central role in extensive international utilization and diffusion of patent information.

CONCLUSION

1. Utility of Patent Information for Technological Innovation

Patent information, disclosed to the public under the patent administration system which protects the rights of patentees, can be the mother of new inventions. After World War II, Japan introduced the latest Western technologies and achieved substantial technological innovation and rapid economic growth by making effective use of patent information. It can evidence the high utility of the patent system and information conducive to technological innovation. (See Figure 35.)

It is recommendable that developing countries envisaging to develop national economy by furthering technological innovation should update patent administration systems for smooth transfer and self-development of new technologies.

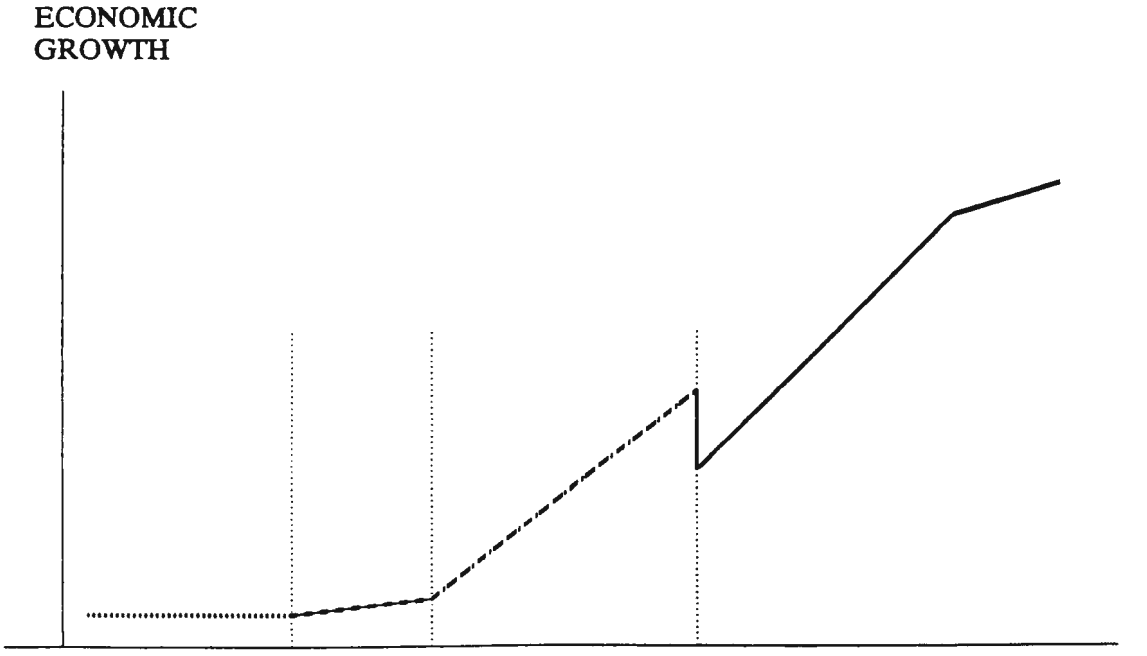
2. Needs for Extensive Utilization of Patent Information

In order to expedite technological innovation, the patent administration system should be tailored to allow private corporations to effectively use patent information. To achieve this end, it is necessary to establish a system to diffuse patent information on the part of the Patent Office and implement a patent information management system on the part of private enterprises to maximize the benefit of patent information.

The Japanese Patent Office is planning to offer Japanese patent information to domestic and overseas interested organizations in a positive manner, hopefully through the international cooperation of WIPO.

FIGURE 1

ECONOMIC GROWTH AND PATENT SYSTEM



Labor Productivity	4.44% /year	9,53% /year
Contribution of Technological Innovation	65%	69%

FIGURE 2

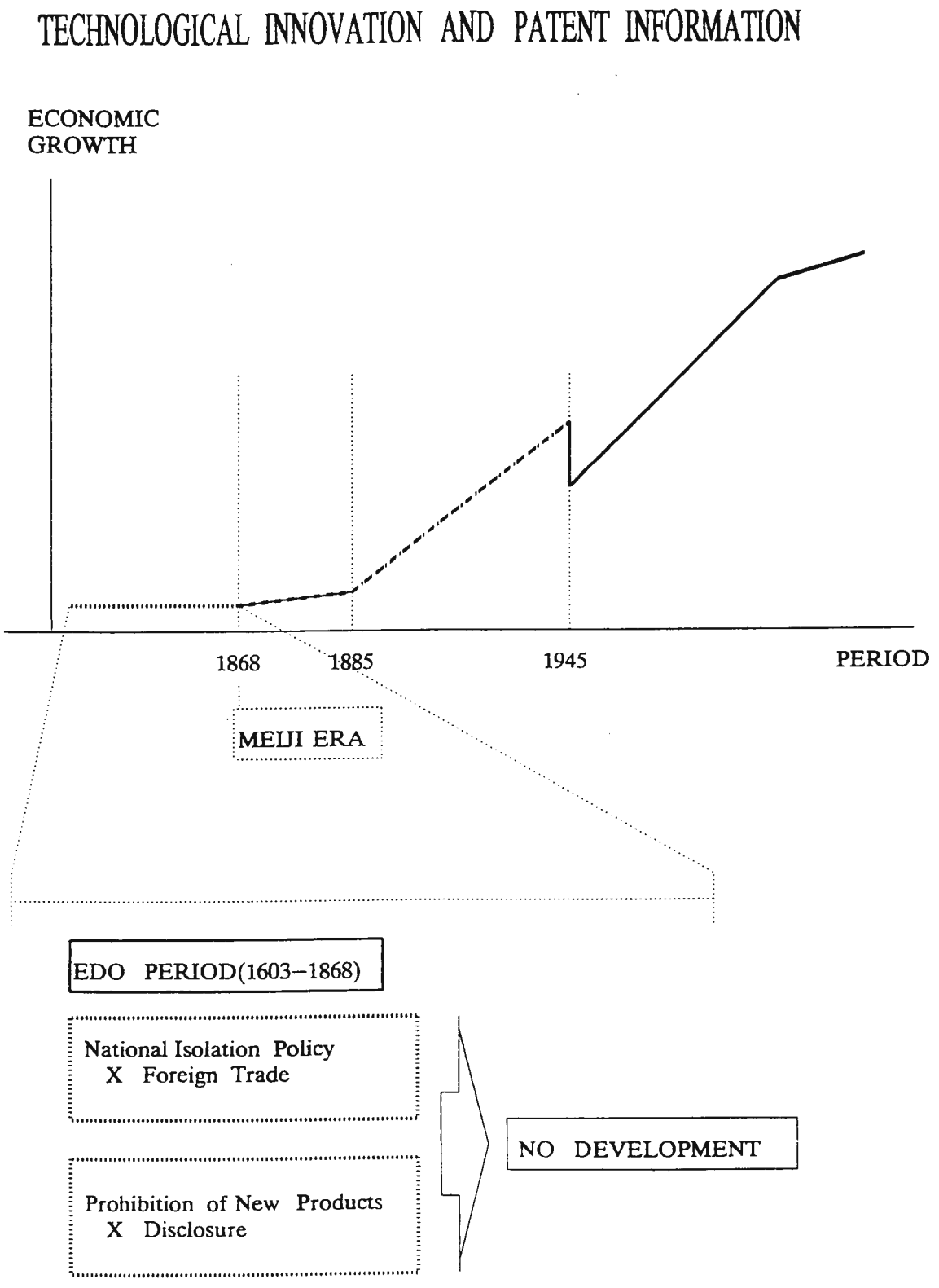

TECHNOLOGICAL INNOVATION AND PATENT INFORMATION
ECONOMIC GROWTH
1868
1885
1945
PERIOD
MEIJI ERA
EDO PERIOD(1603–1868)
National Isolation Policy X Foreign Trade
Prohibition of New Products X Disclosure
NO DEVELOPMENT

FIGURE 3

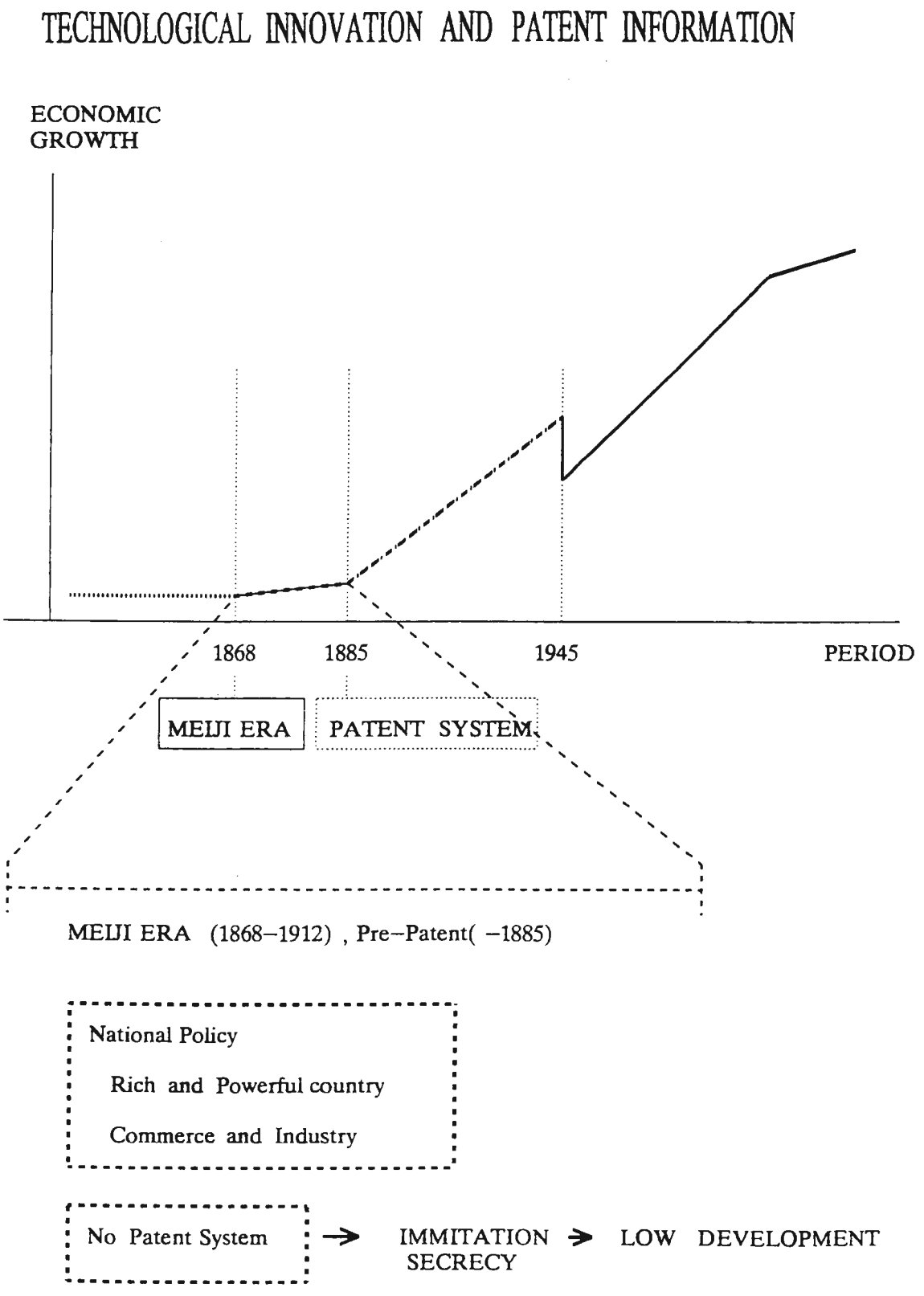

TECHNOLOGICAL INNOVATION AND PATENT INFORMATION
ECONOMIC GROWTH
1868
1885
1945
PERIOD
MEIJI ERA
PATENT SYSTEM
MEIJI ERA (1868–1912) , Pre–Patent(–1885)
National Policy
Rich and Powerful country
Commerce and Industry
No Patent System
IMMITATION
SECRECY
LOW DEVELOPMENT

FIGURE 4

Mr. Tatti Gaun

Spinning apparatus

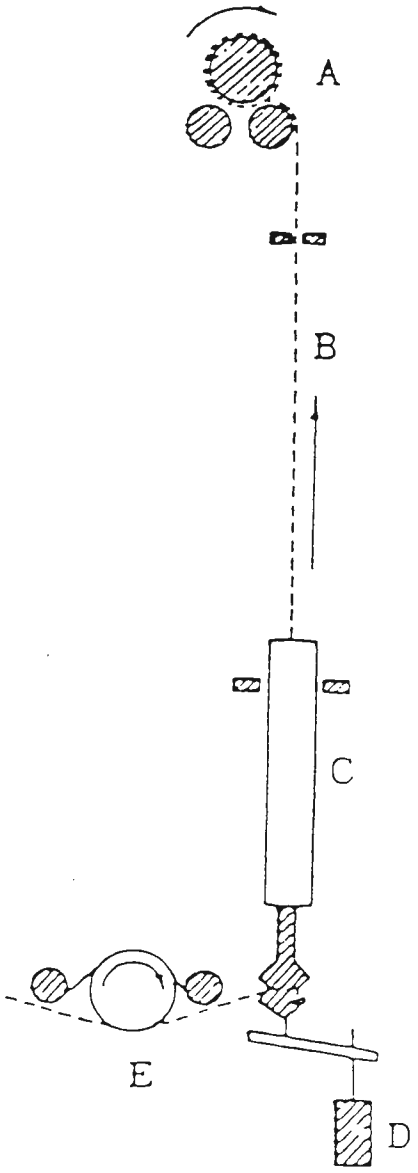


FIGURE 5

Mr.Isozaki

Fancy mat made of rush

Weaving machine

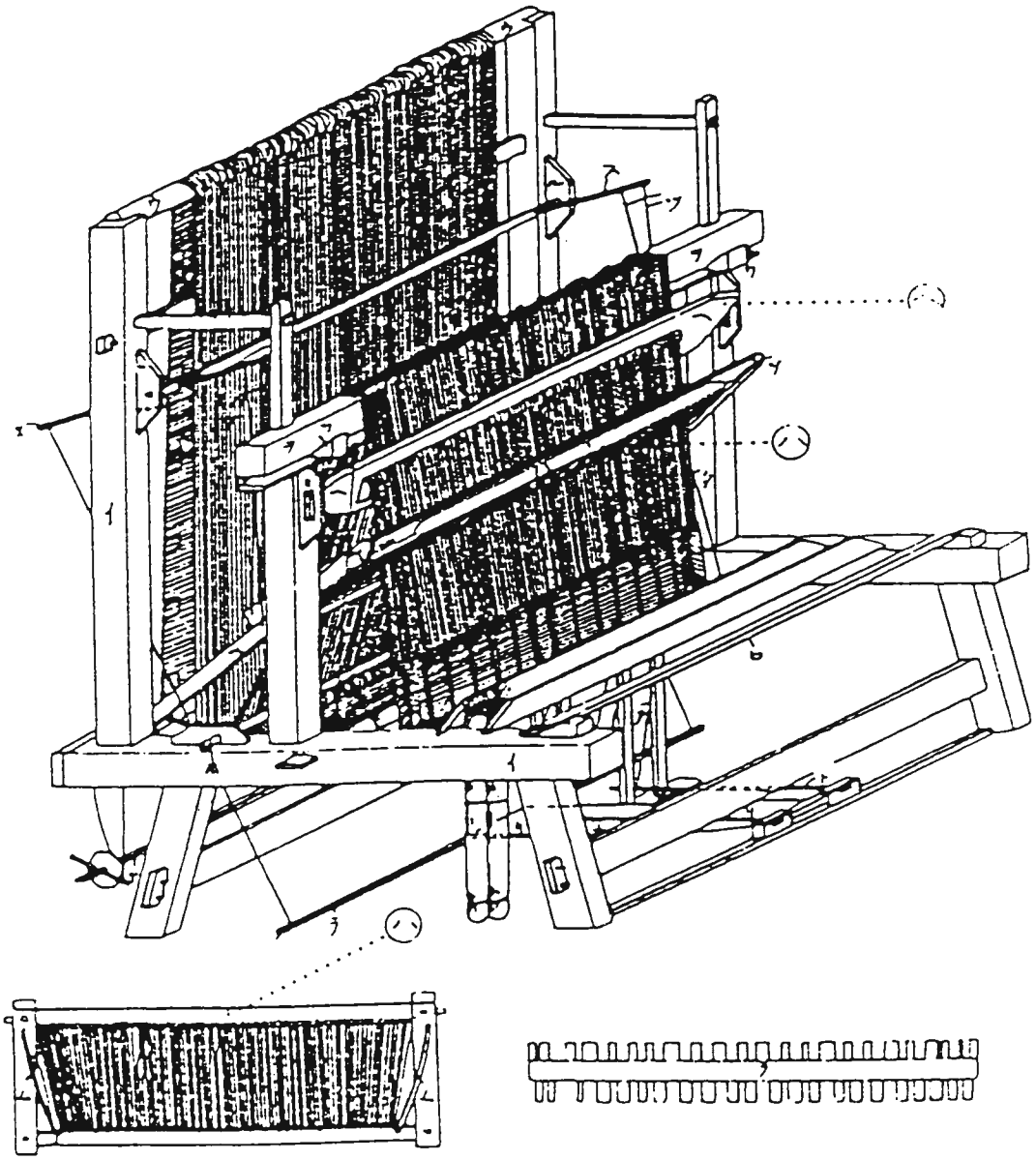


FIGURE 6

INSTITUTION OF PATENT ADMINISTRATION SYSTEMS IN JAPAN

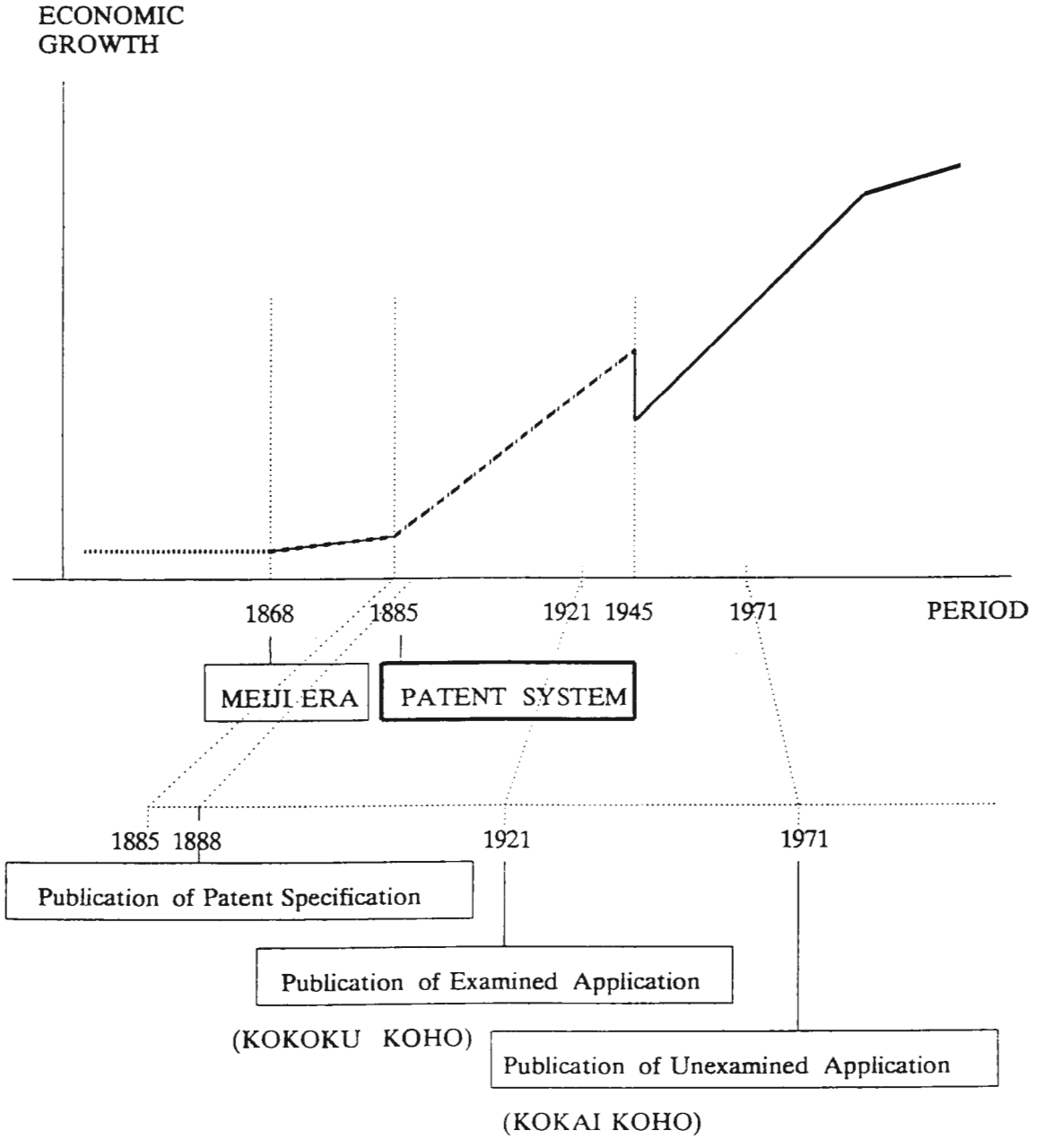
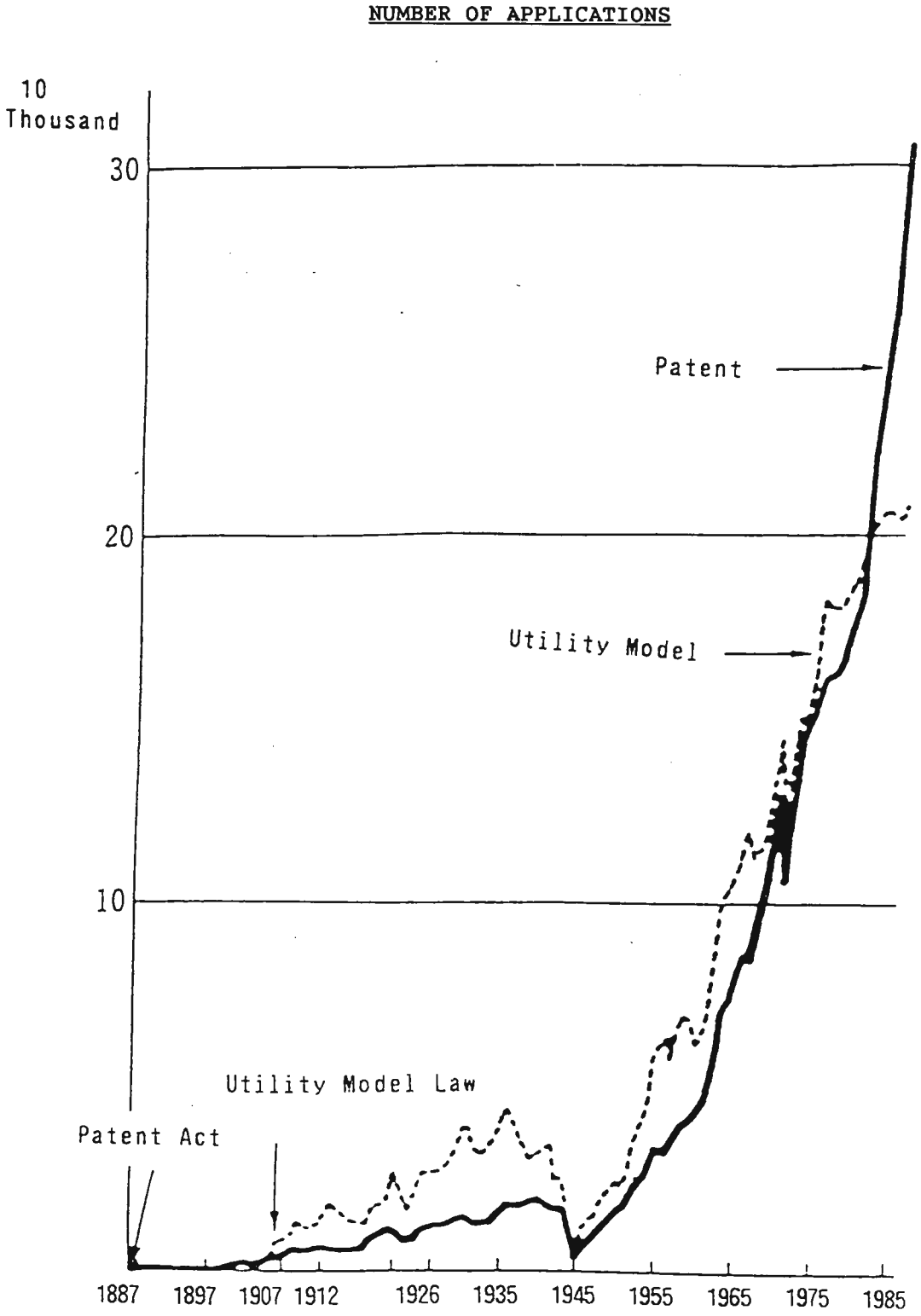
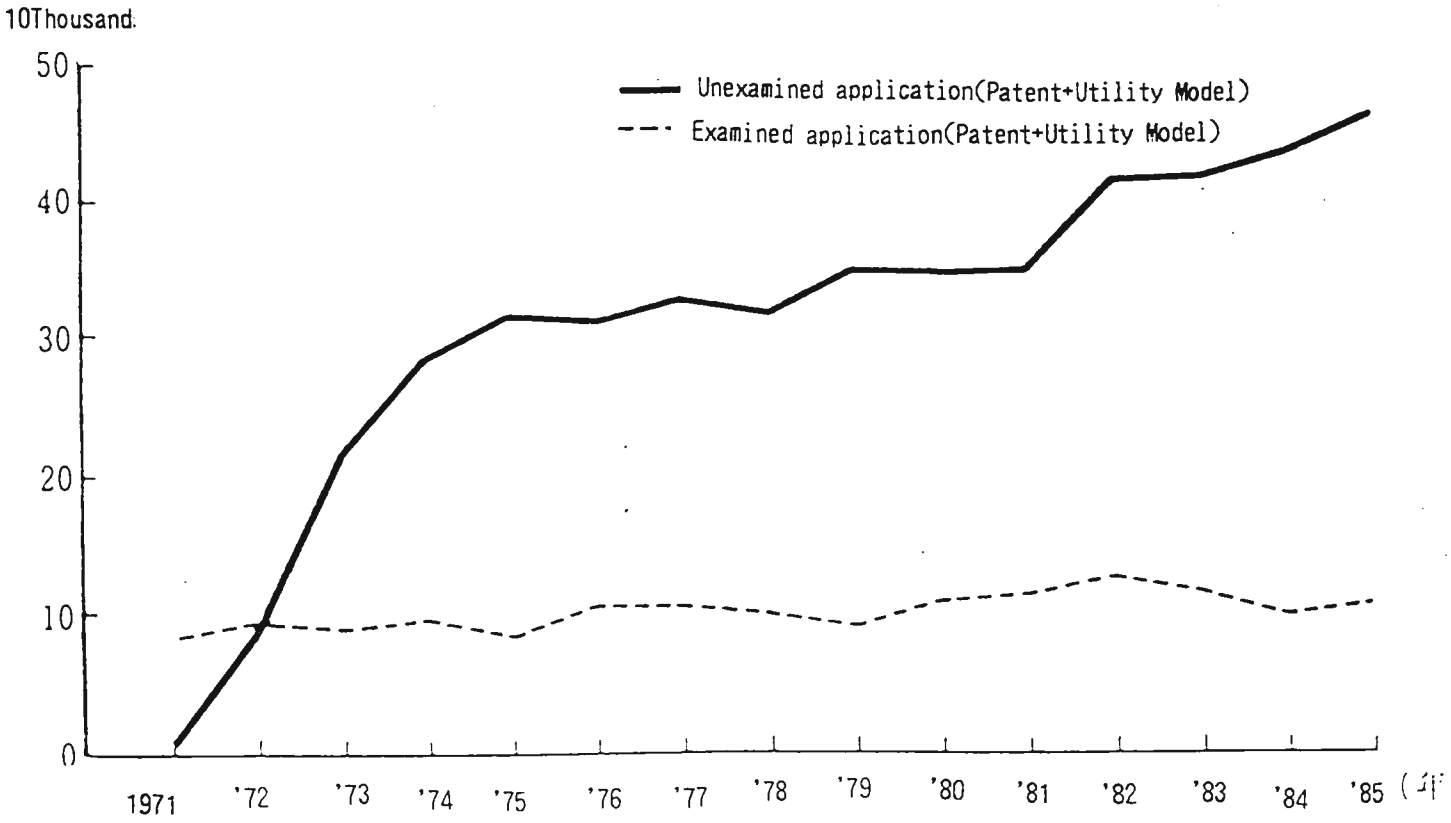


FIGURE 7



Trend of Number of Applications

FIGURE 8



TREND OF PUBLICATION

FIGURE 9

TREND OF NUMBER OF PATENT AND

UTILITY MODEL APPLICATIONS

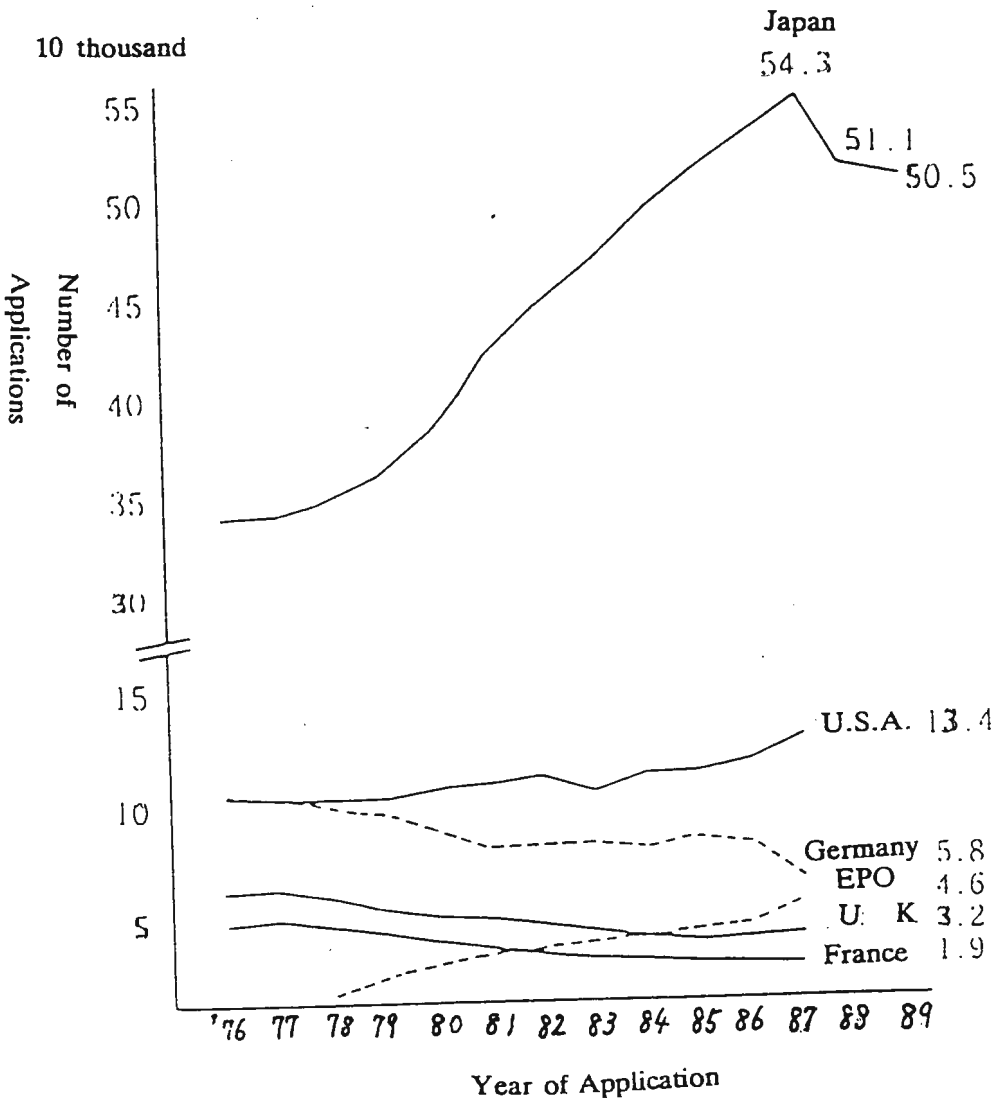


FIGURE 10

NUMBER OF PATENT & UTILITY MODEL APPLICATIONS IN EACH COUNTRY

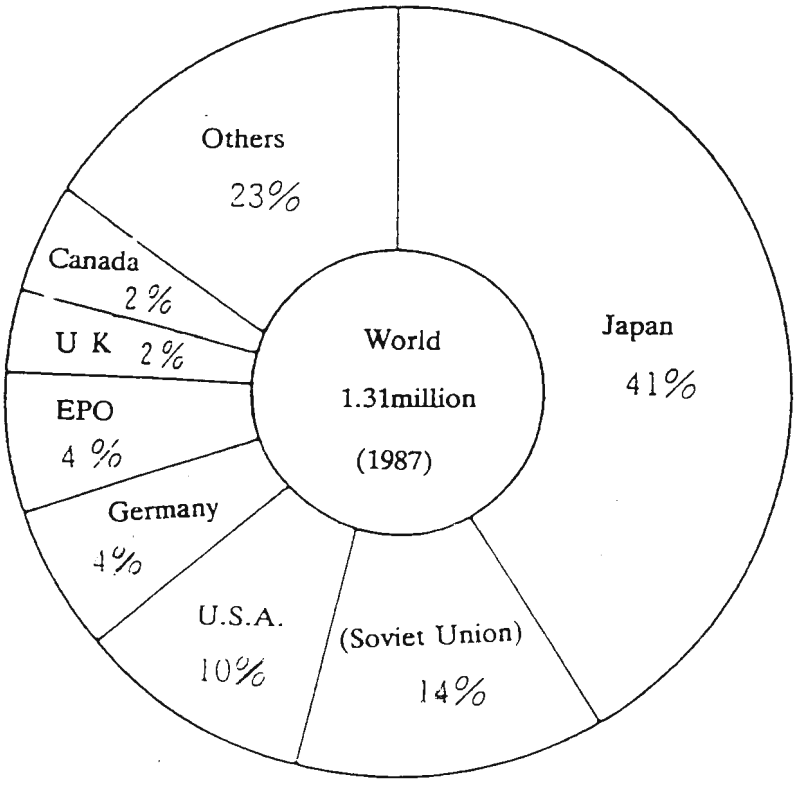


FIGURE 11

INCREASE OF NUMBER OF APPLICATIONS

IN HIGH-TECHNOLOGICAL FIELD

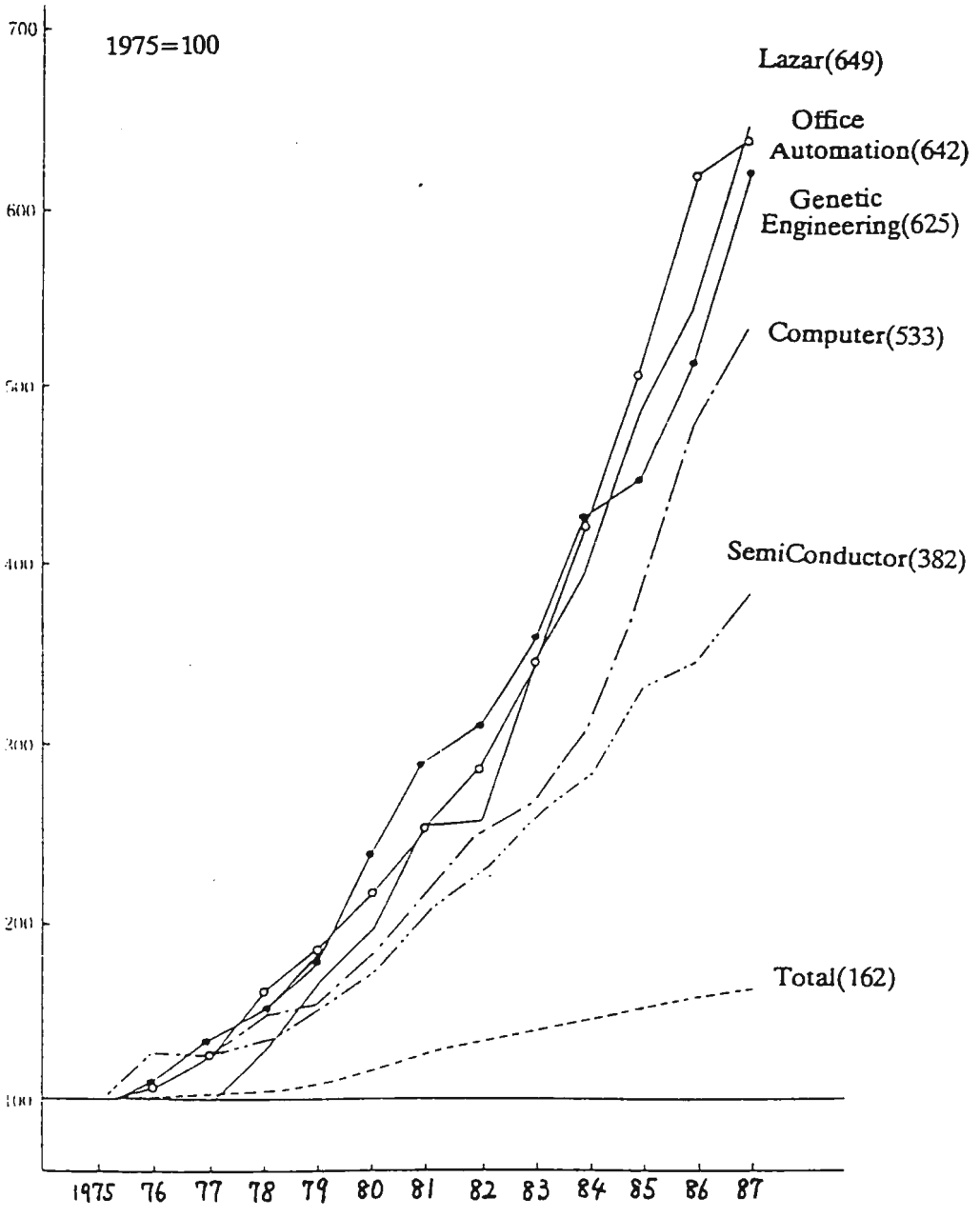


FIGURE 12

TECHNOLOGICAL INNOVATION AND PATENT INFORMATION

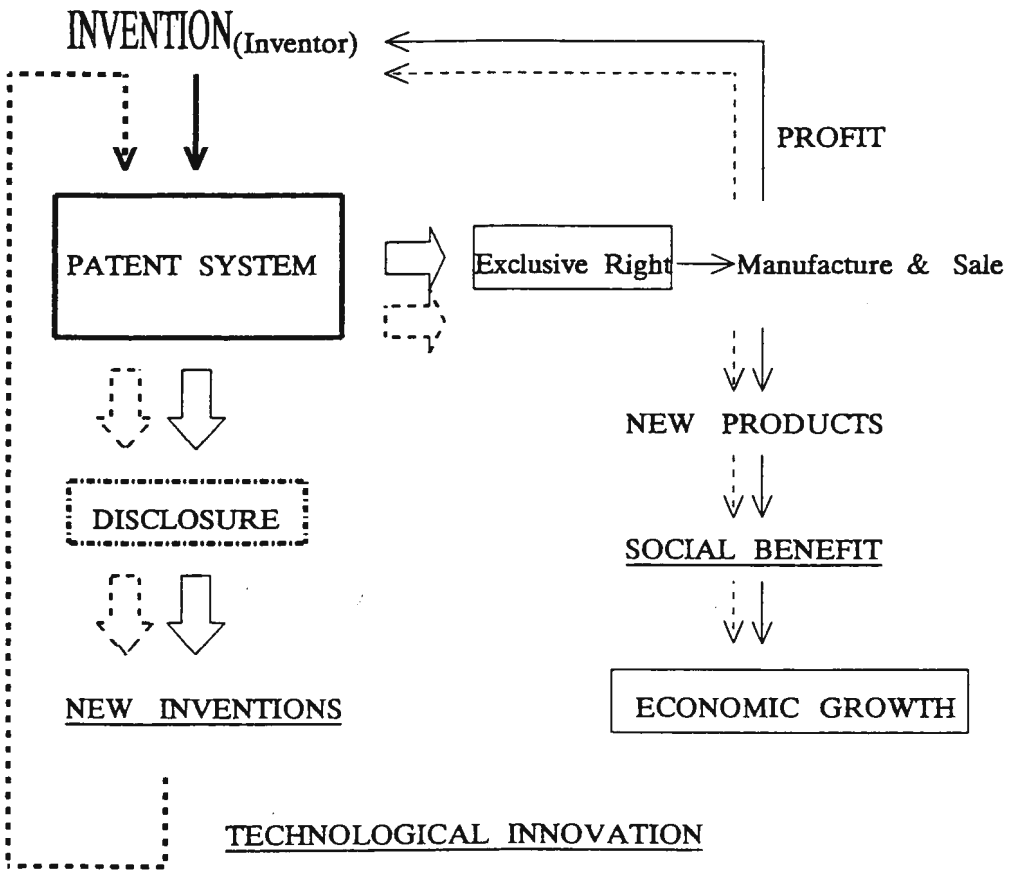
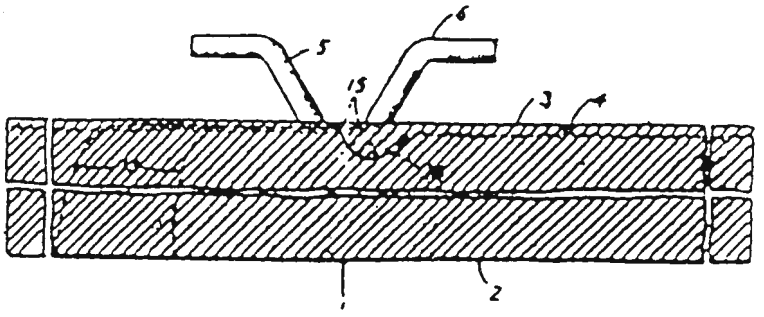


FIGURE 13

Point-Contact type Transistor

図 特許第181313号



Junction-type Transistor

図 特許第183600号

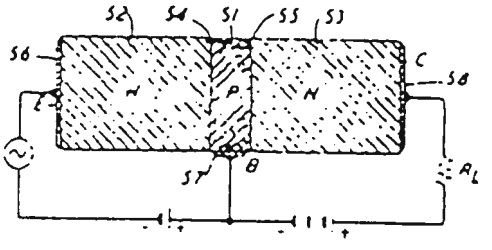


FIGURE 14

Number of Publication of Examined(Unexamined) Applications on Junction Forming Technique of Transistor

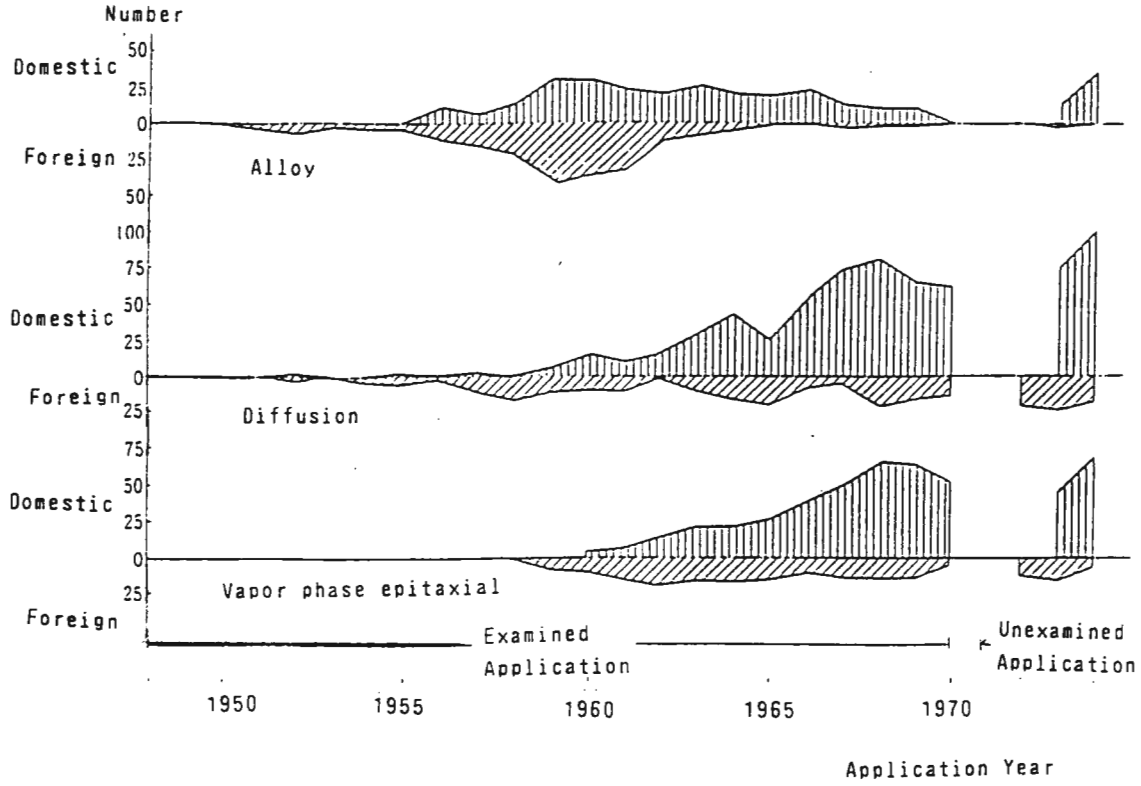


FIGURE 15

Number of Publication of Examined(Unexamined) Applications on IC manufacturing technique

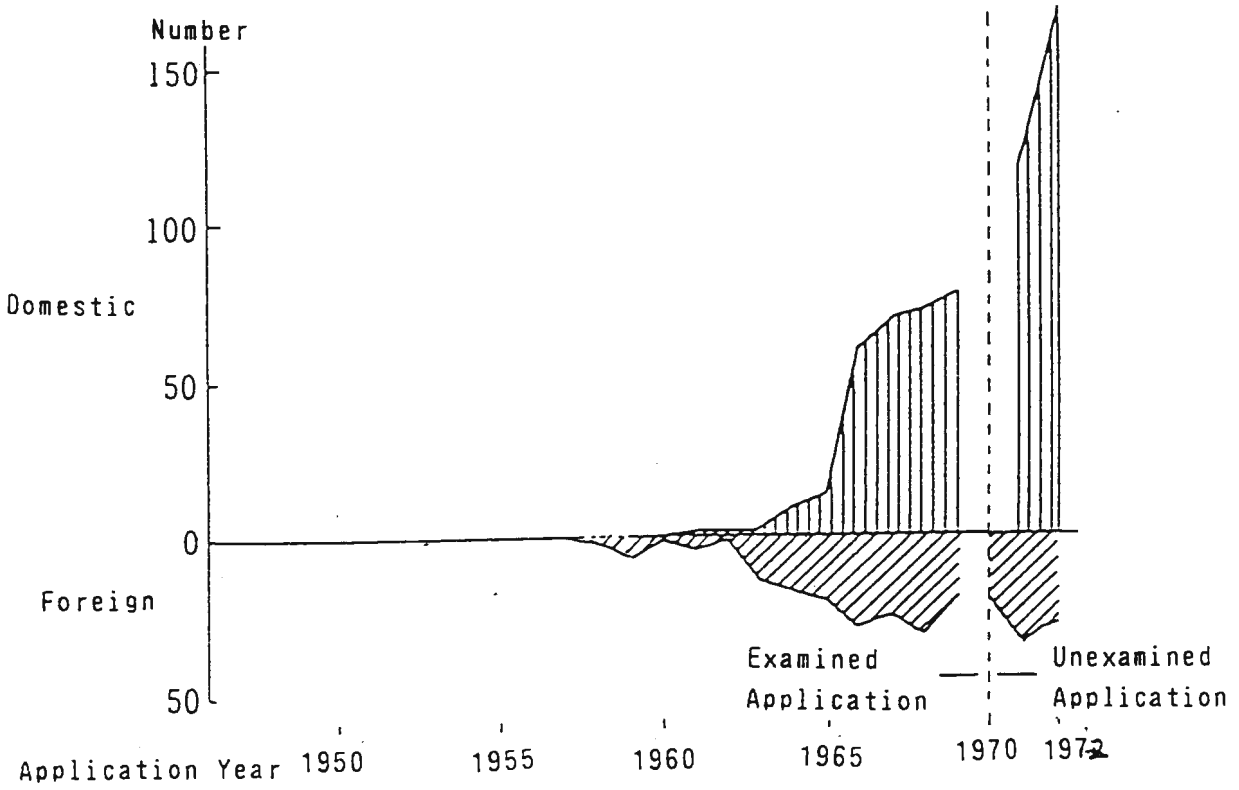


FIGURE 16

Number of Publication of Examined(Unexamined) Applications on peripheral technique of semiconductor device

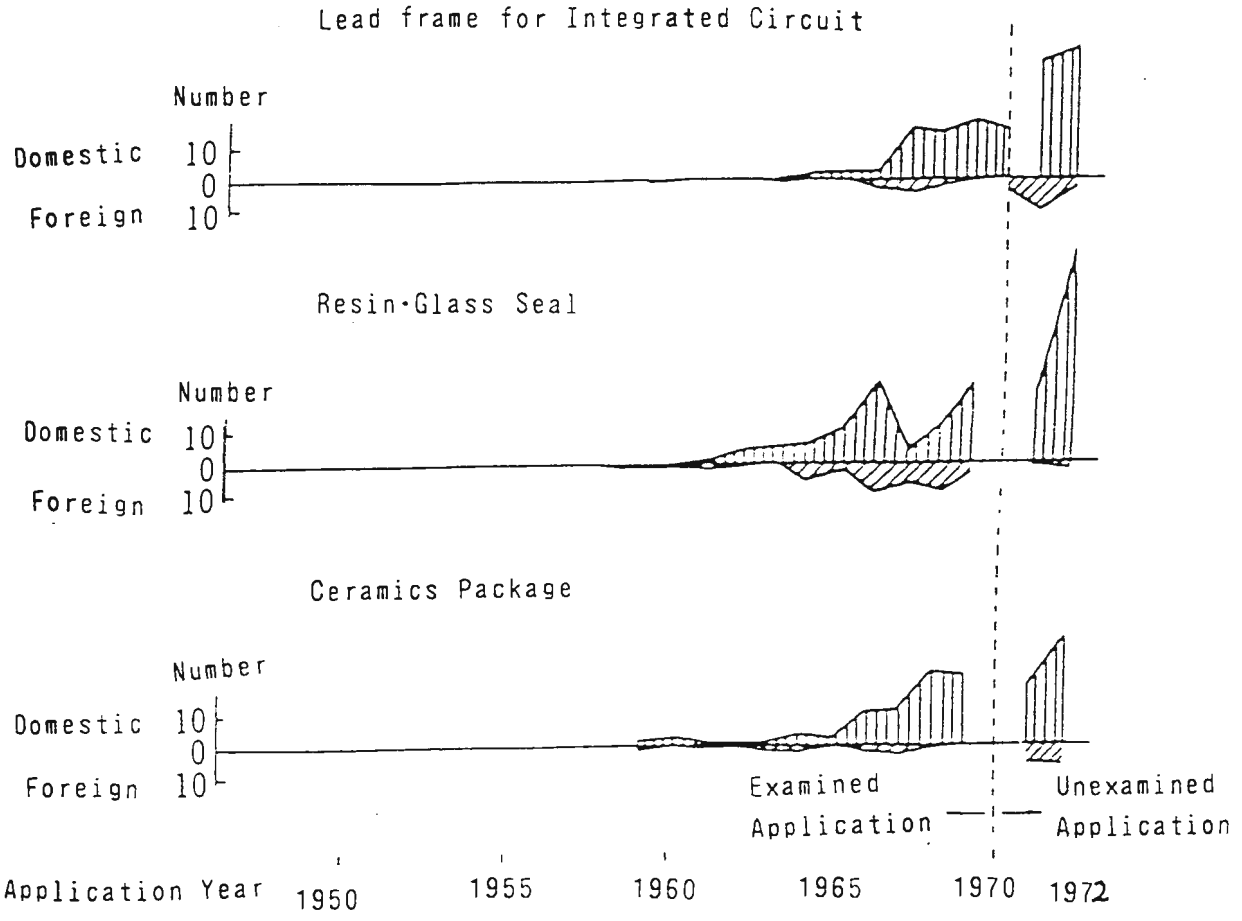


FIGURE 17

Number of Patent Applications on Semiconductor

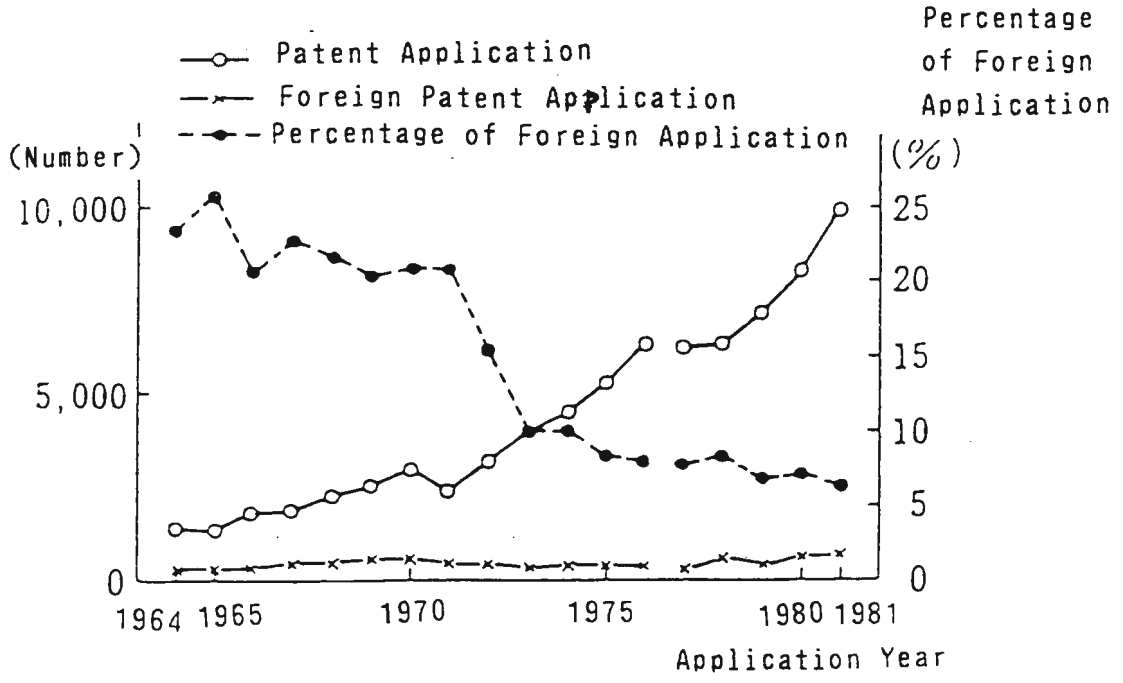


FIGURE 18

特許第90593号 "BROWN" TUBE FOR TELEVISION

Mr.Takayanagi,JP90593

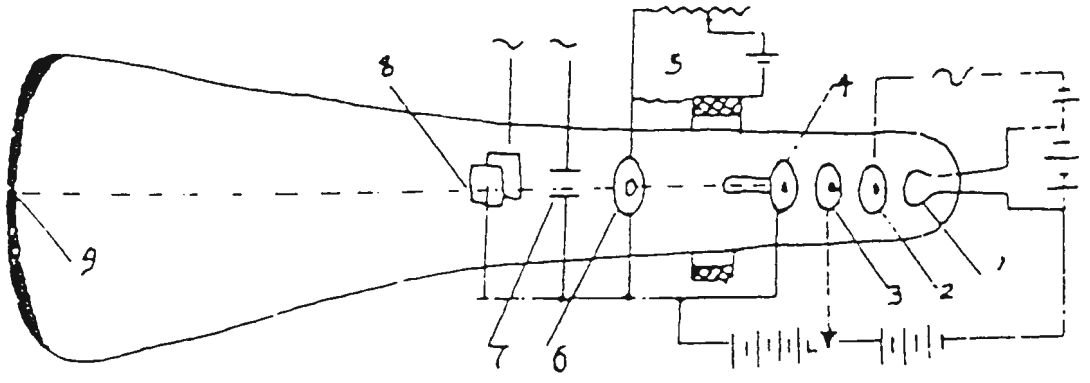


FIGURE 19

NUMBER OF APPLICATIONS ON TELEVISION

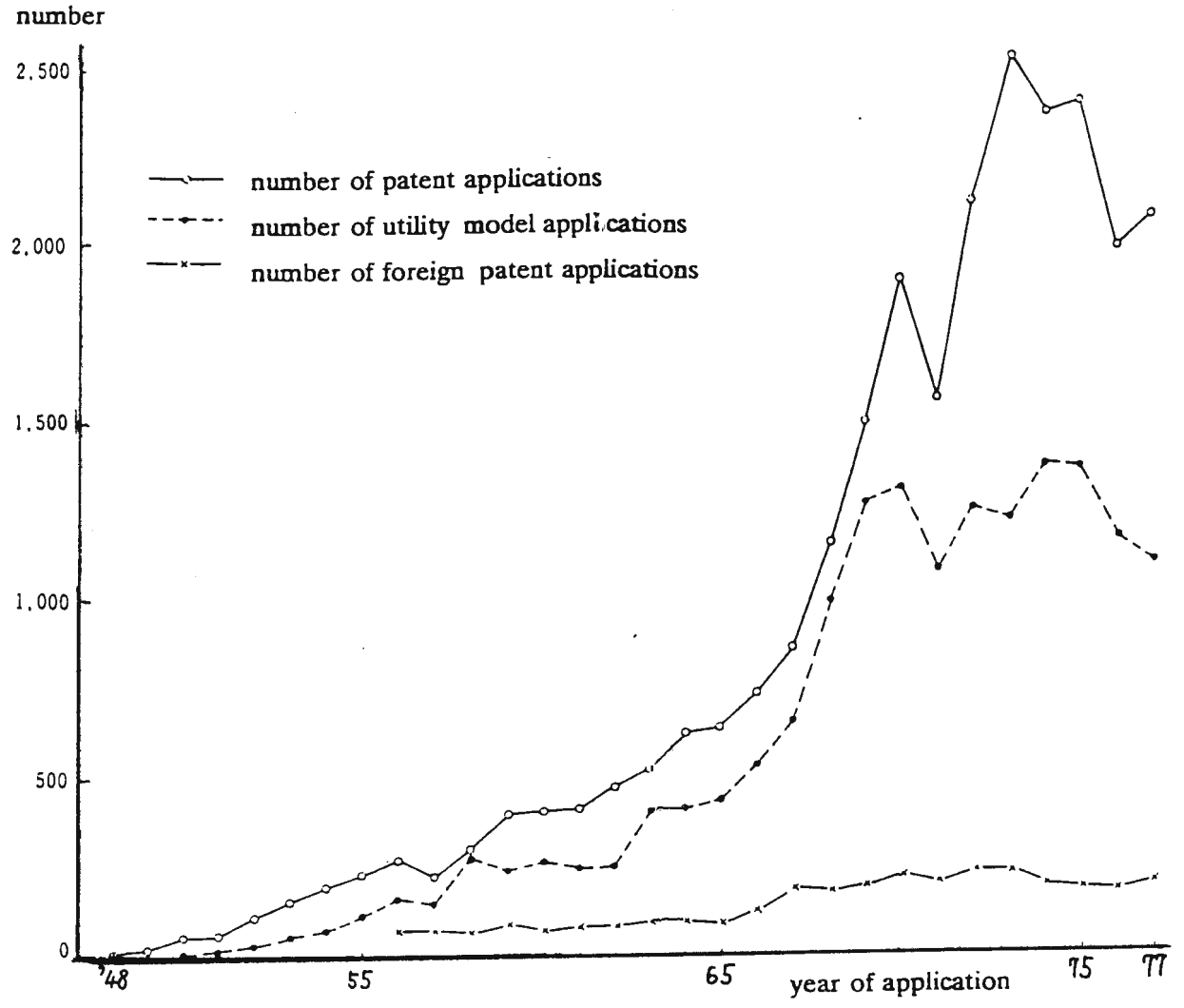


FIGURE 20

NUMBER OF APPLICATIONS AND PUBLICATIONS

ON COLOR TV "BROWN" TUBE

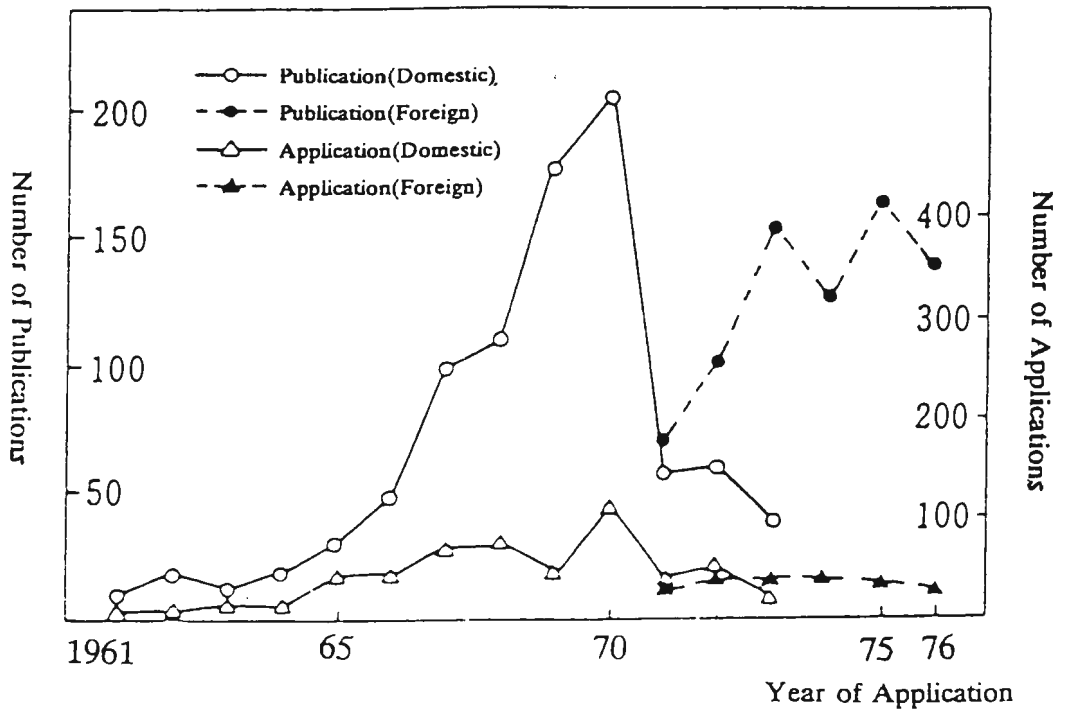


FIGURE 21

NUMBER OF PRODUCTION & EXPORT OF COLOR TELEVISION

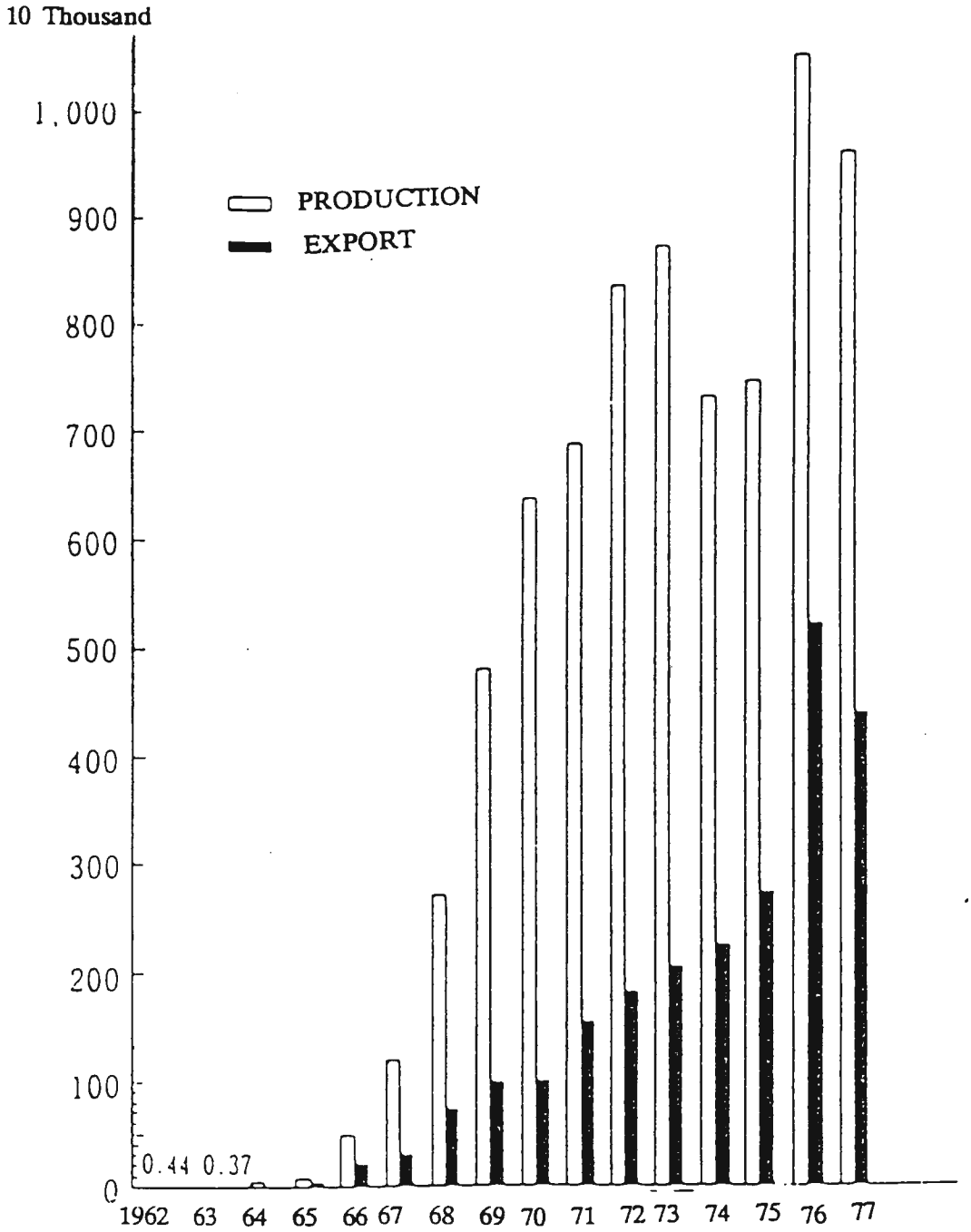


FIGURE 22

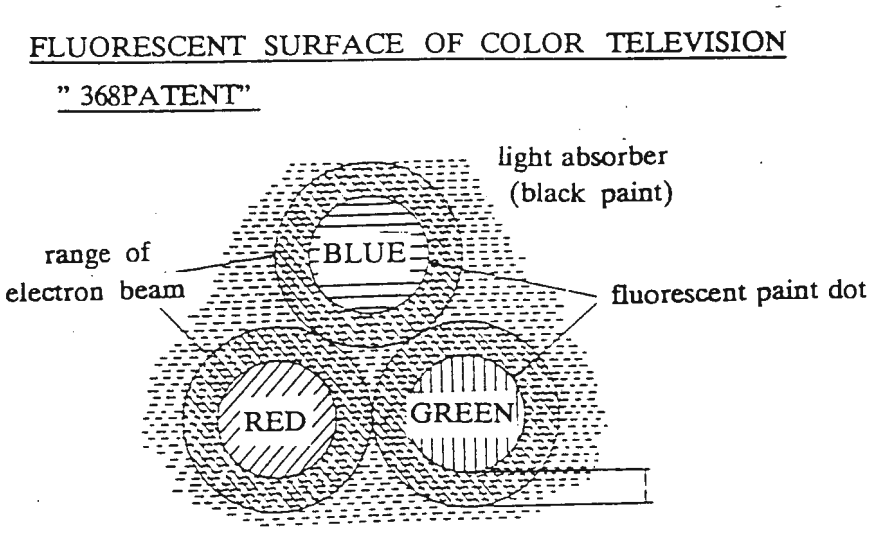


FIGURE 23

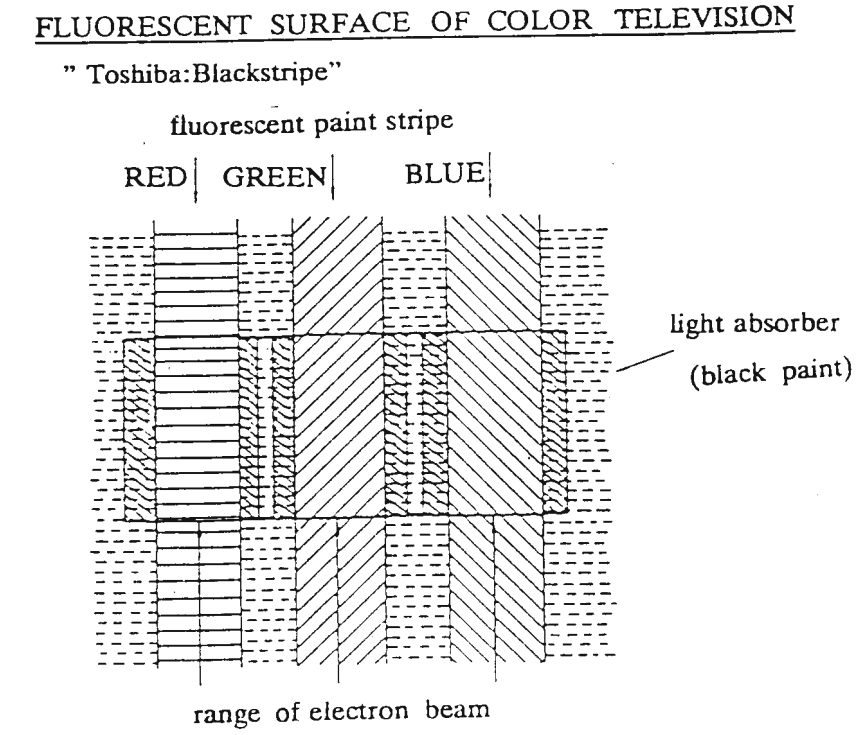


FIGURE 24

Amount of Scientific and Technological Information/year(1977)

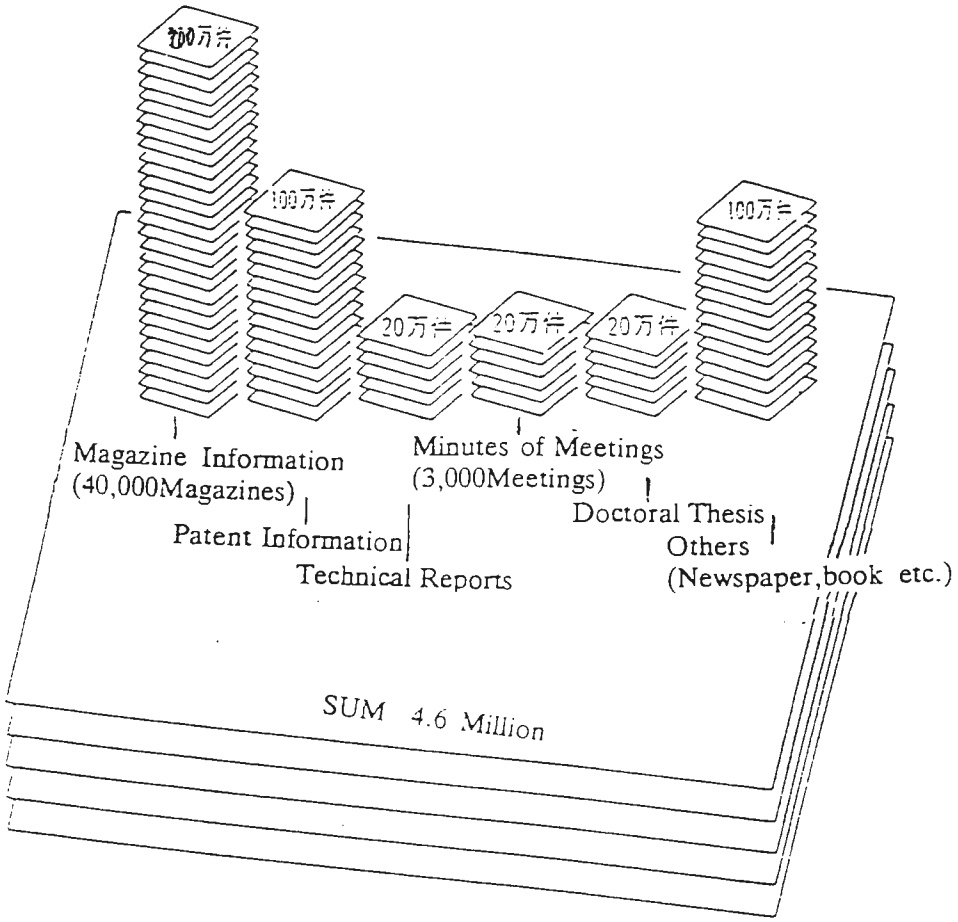


FIGURE 25

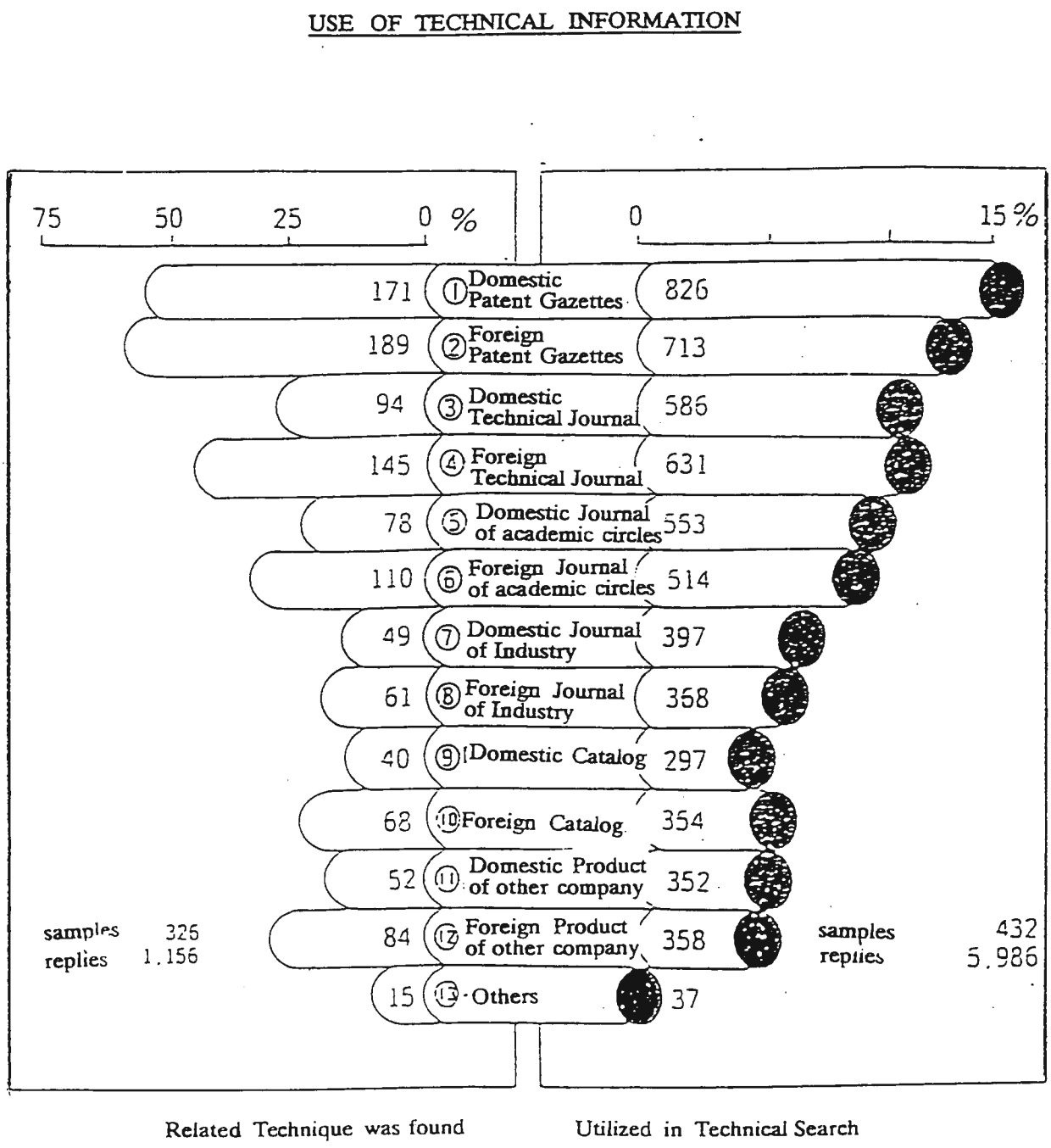

USE OF TECHNICAL INFORMATION
75
50
25
0 %
0
15 %
171 ① Domestic Patent Gazettes 826
189 ② Foreign Patent Gazettes 713
94 ③ Domestic Technical Journal 586
145 ④ Foreign Technical Journal 631
78 ⑤ Domestic Journal of academic circles 553
110 ⑥ Foreign Journal of academic circles 514
49 ⑦ Domestic Journal of Industry 397
61 ⑧ Foreign Journal of Industry 368
40 ⑨ Domestic Catalog 297
68 ⑩ Foreign Catalog 354
52 ⑪ Domestic Product of other company 352
84 ⑫ Foreign Product of other company 358
15 ⑬ Others 37
samples 325
replies 1.156
samples 432
replies 5.986
Related Technique was found
Utilized in Technical Search

FIGURE 26

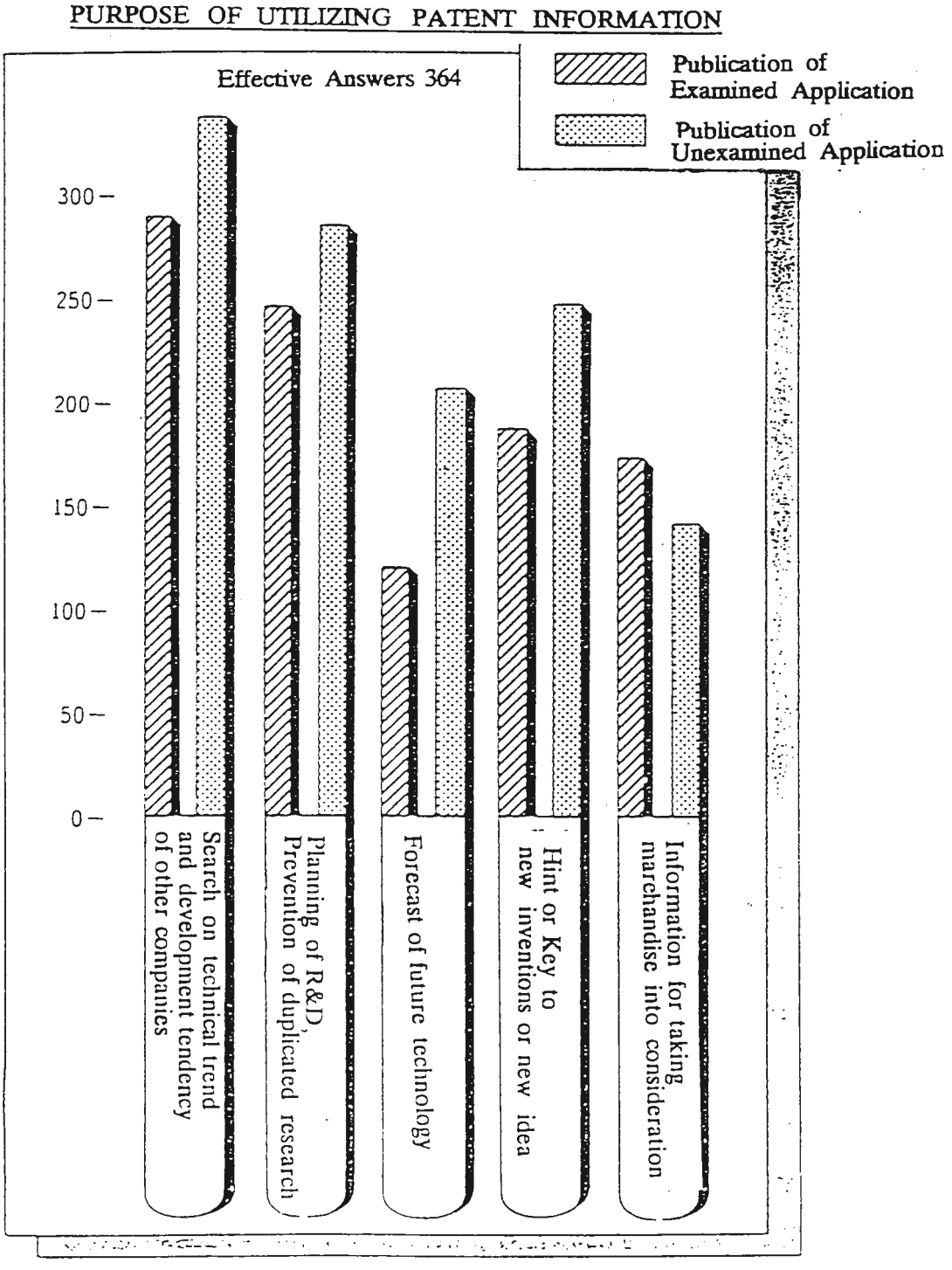

PURPOSE OF UTILIZING PATENT INFORMATION
Effective Answers 364
Publication of Examined Application
Publication of Unexamined Application
300
250
200
150
100
50
0
Search on technical trend and development tendency of other companies
Planning of R&D, Prevention of duplicated research
Forecast of future technology
Hint or Key to new inventions or new idea
Information for taking marchandise into consideration

FIGURE 27

UTILIZATION OF PATENT INFORMATION IN CORPORATIONS

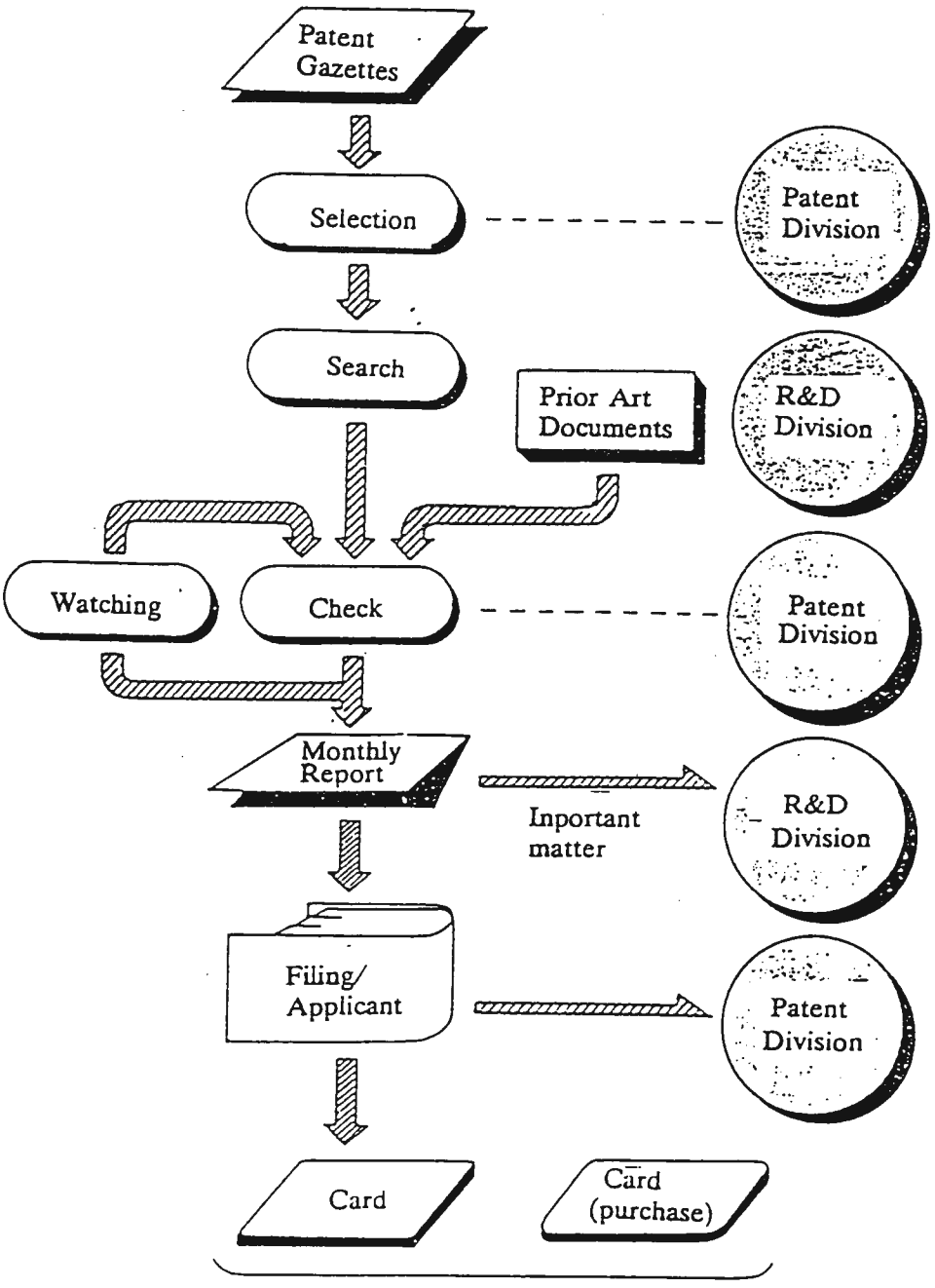


FIGURE 28

MAIN DATABASE

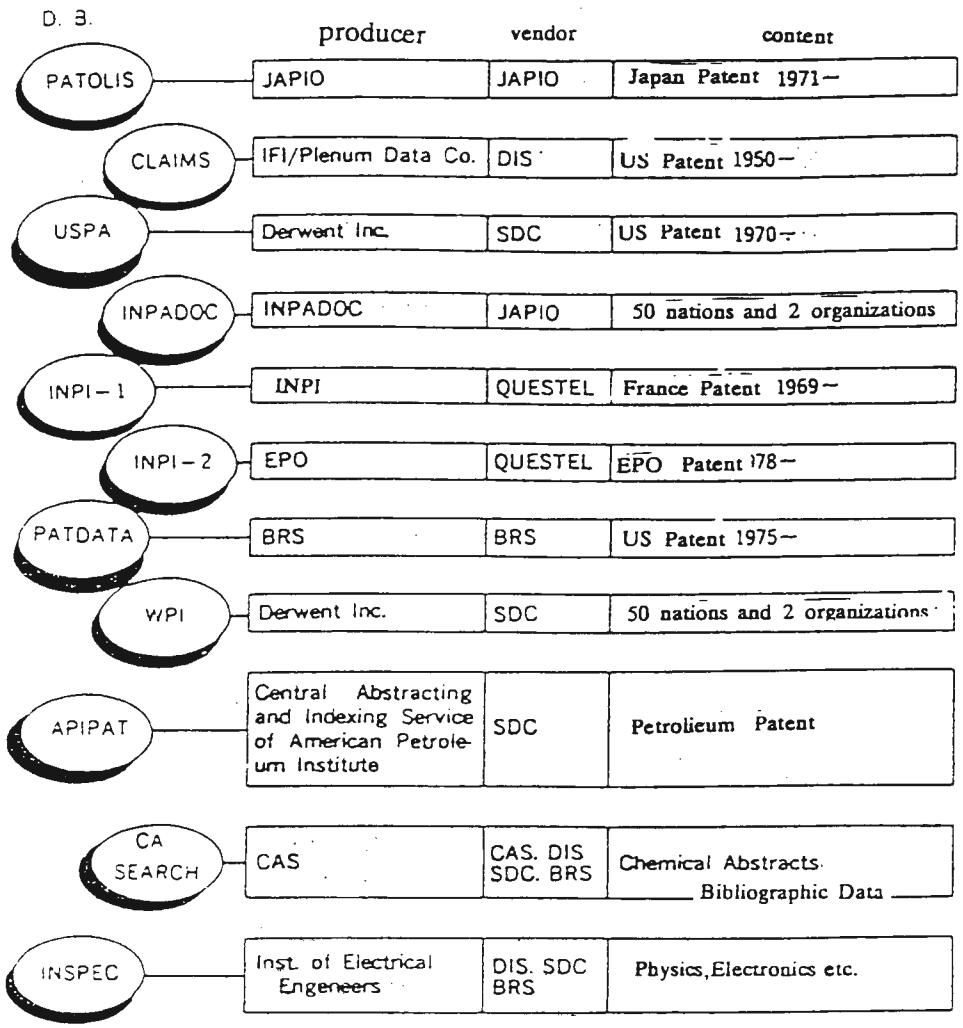


FIGURE 29

THE SHARE OF PATENT MANAGEMENT EXPENSES

PAYMENT TO JPO	11.6%
INFORMATION EXPENSES	10.1%
PAYMENT TO PATENT ATTORNEY	20.5%
PERSONNEL EXPENSES	31.9%
PAYMENT TO FOREIGN COUNTRIES	25.9%

IN 1987

272 LARGE COMPANIES
68 SMALL COMPANIES & INDIVIDUALS

FIGURE 30

CHANNELS OF PATENT INFORMATION SERVICE

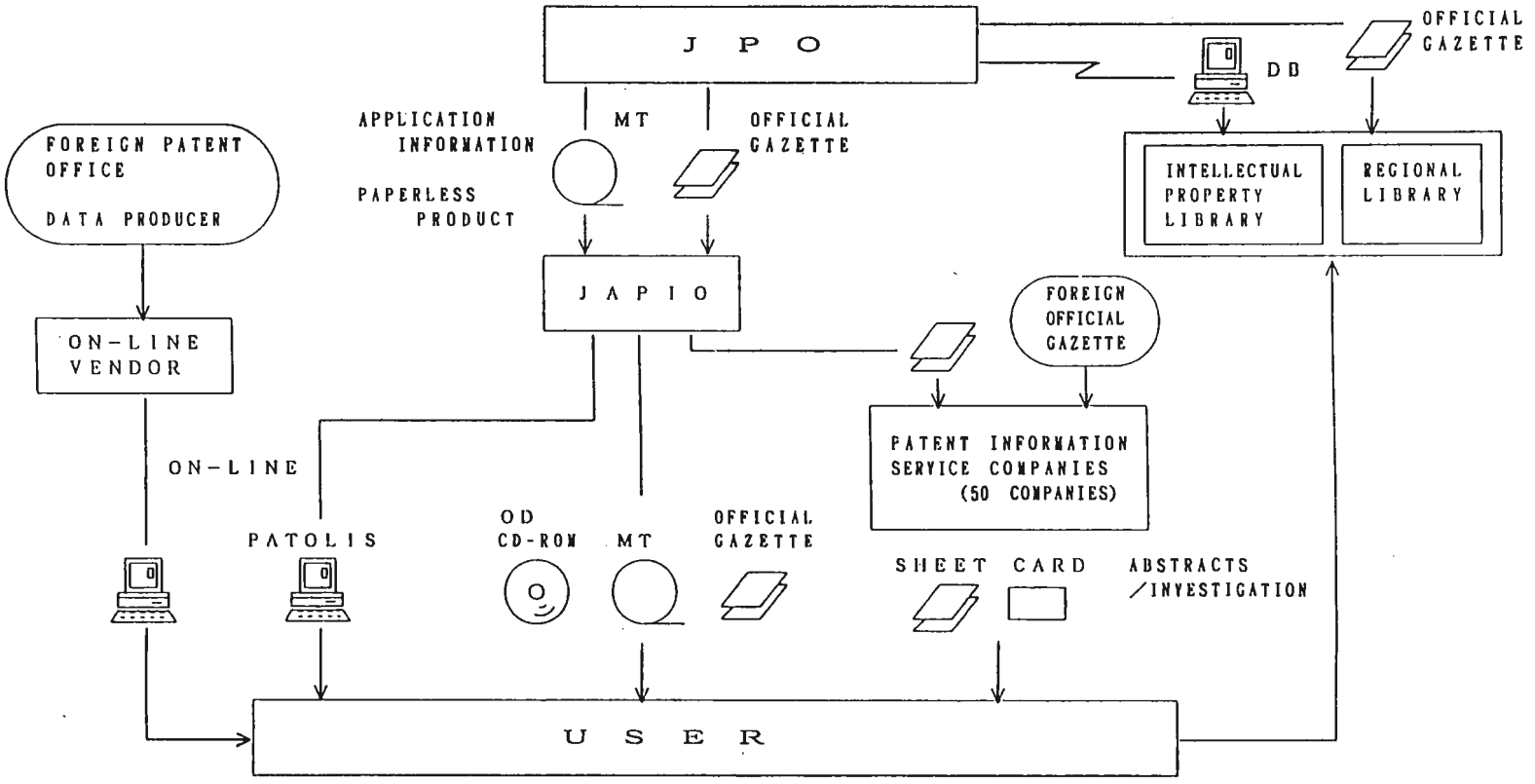


FIGURE 31

MEDIA OF PATENT INFORMATION

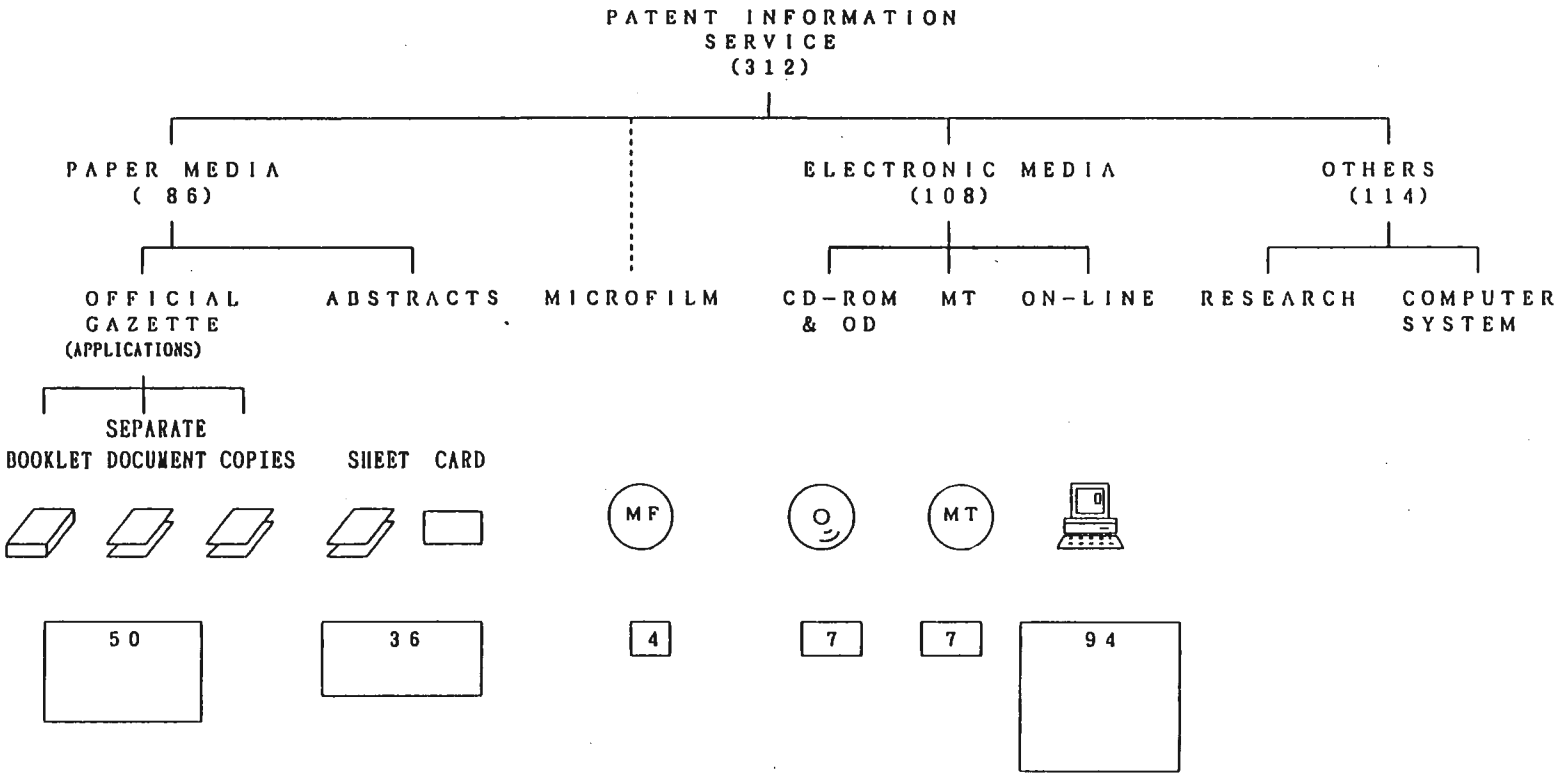


FIGURE 32

CHARACTERISTIC OF CD·ROM, OD

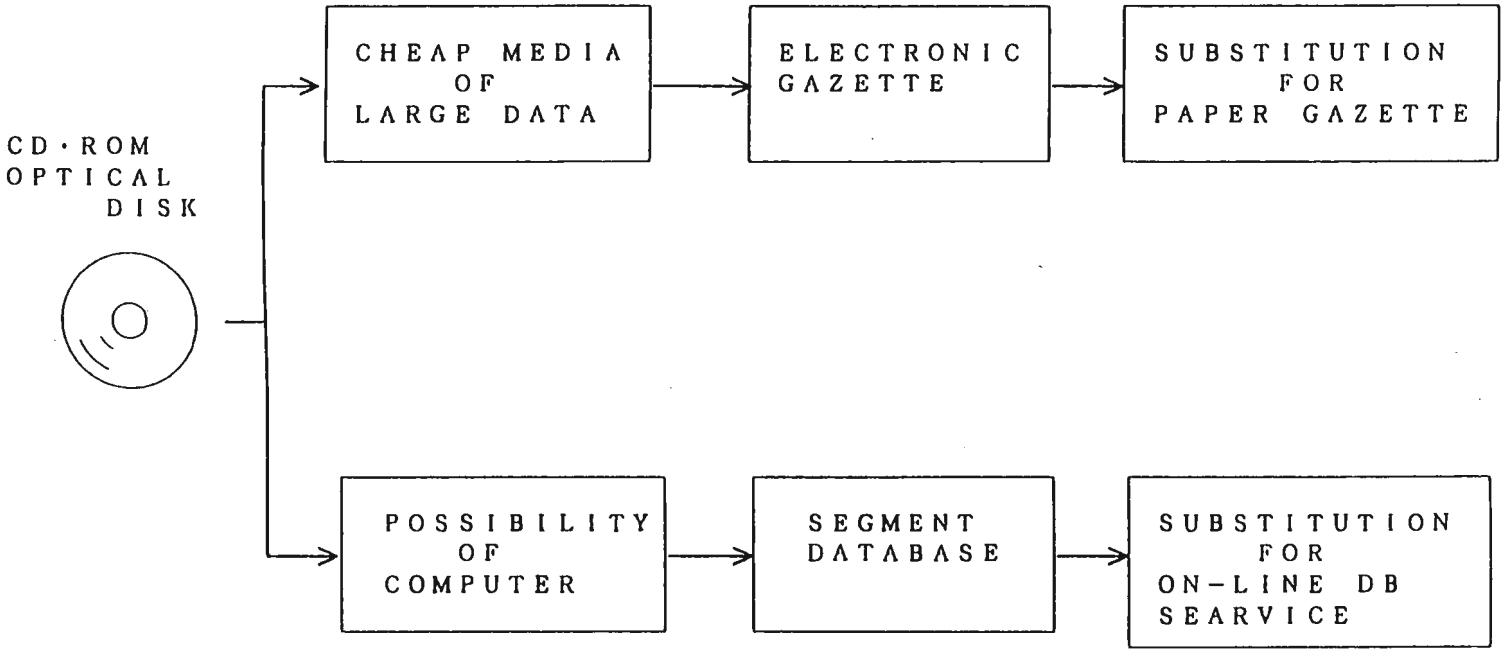


FIGURE 33

CHANGE OF PATENT INFORMATION MEDIA

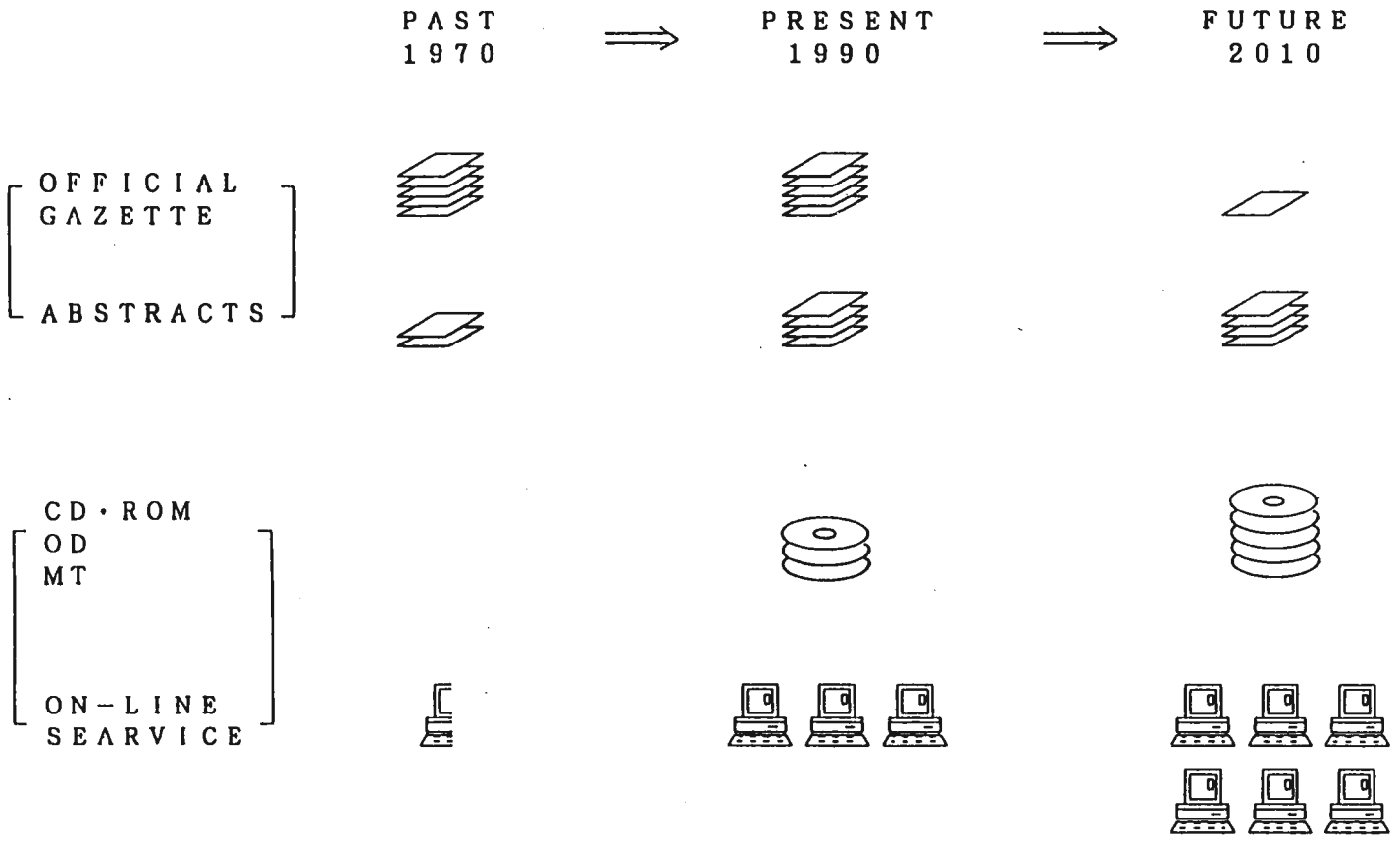
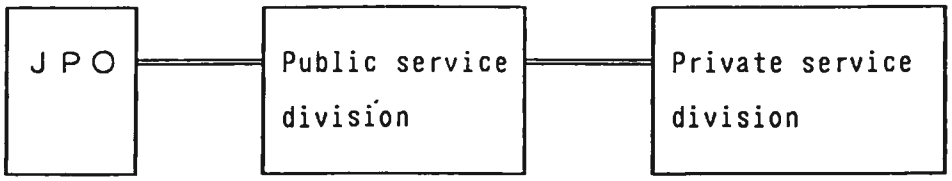


FIGURE 34

JPO' s PATENT INFORMATION DISSEMINATION POLICY

1. Role of Organizations



2. Distribution of Japanese Patent Information

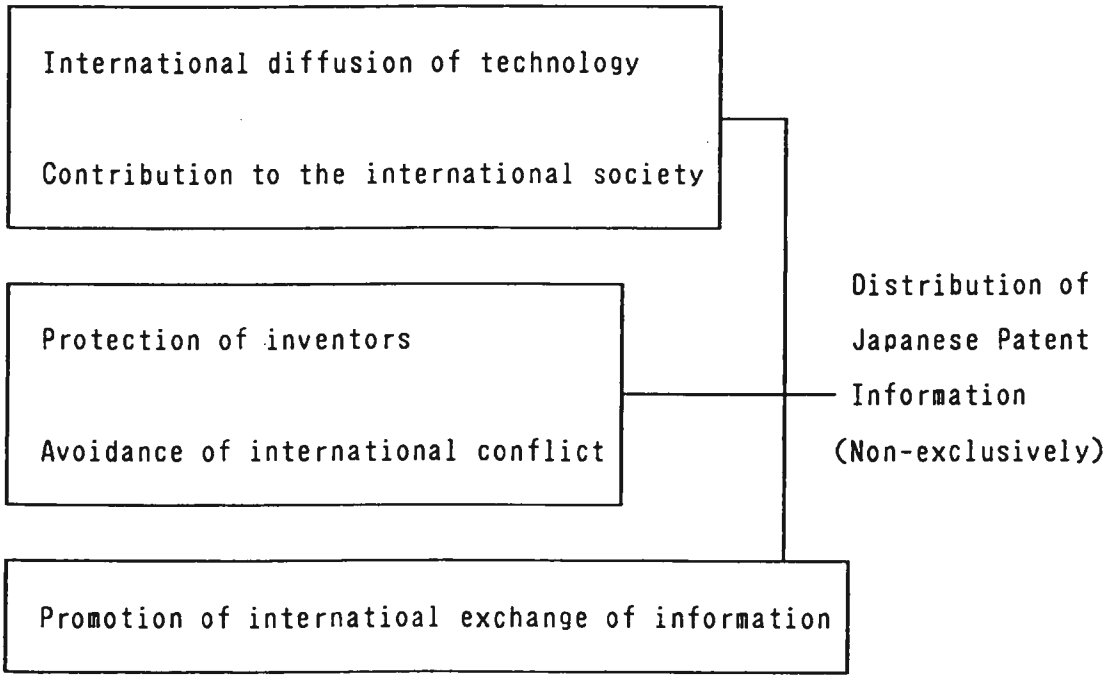
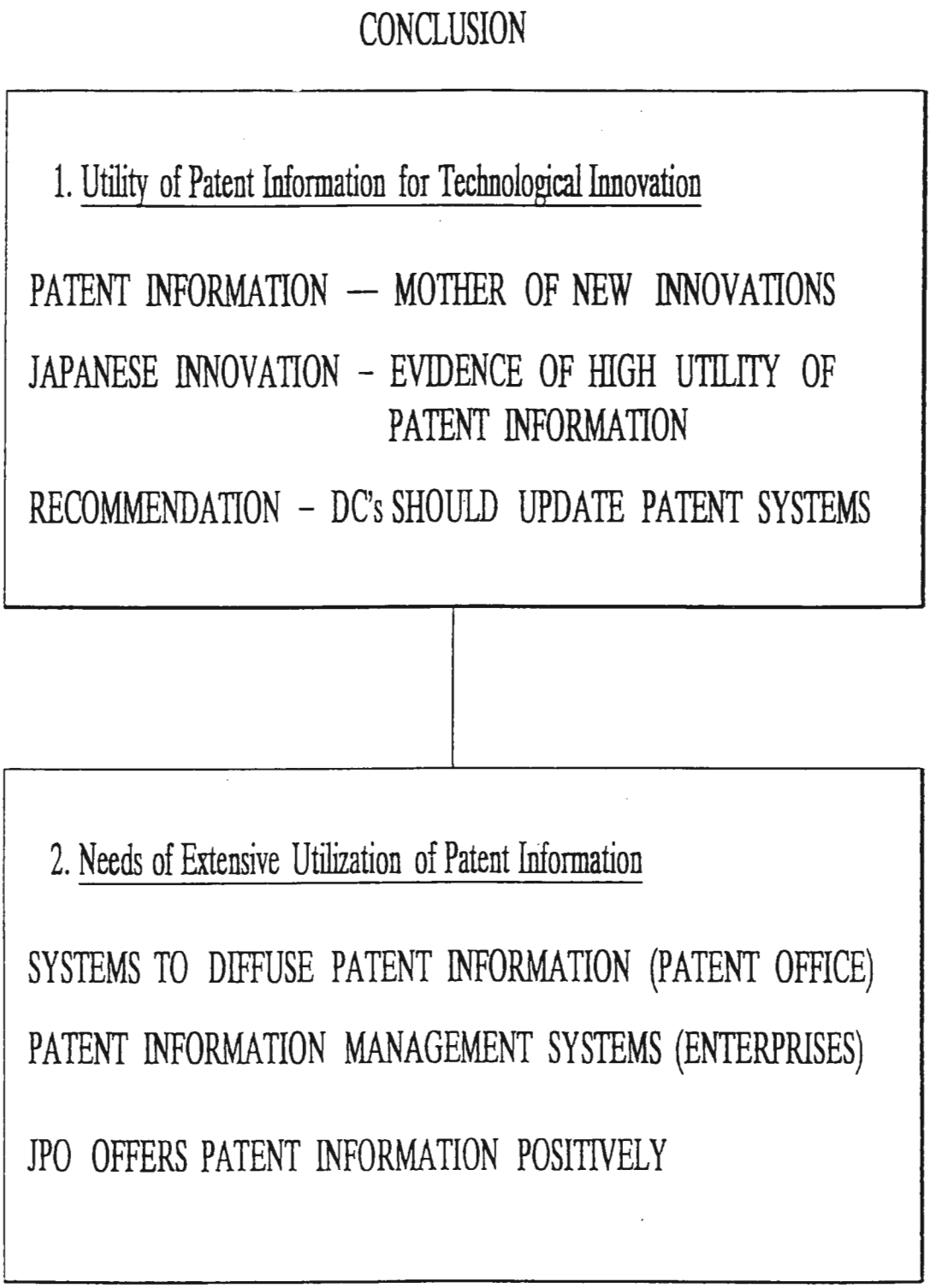


FIGURE 35


CONCLUSION
1. Utility of Patent Information for Technological Innovation
PATENT INFORMATION — MOTHER OF NEW INNOVATIONS
JAPANESE INNOVATION - EVIDENCE OF HIGH UTILITY OF PATENT INFORMATION
RECOMMENDATION - DC's SHOULD UPDATE PATENT SYSTEMS
2. Needs of Extensive Utilization of Patent Information
SYSTEMS TO DIFFUSE PATENT INFORMATION (PATENT OFFICE)
PATENT INFORMATION MANAGEMENT SYSTEMS (ENTERPRISES)
JPO OFFERS PATENT INFORMATION POSITIVELY

THE TECHNOLOGICAL INNOVATION PROCESS; PATENT DOCUMENTATION AS A SOURCE OF TECHNOLOGICAL INFORMATION*

by

Mr. Ronald E. Myrick
Assistant General Counsel
Digital Equipment Corporation
Maynard, Massachusetts
United States of America

TABLE OF CONTENTS

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* The authors of this paper, Messrs. Ronald E. Myrick, William P. Skladony, and Ram Nath, of Digital Equipment Corporation, wish to express their gratitude to Mr. N. Rhys Merrett of Digital Equipment Corporation for his contribution to the researching, writing, and editing of this paper. The authors are also very grateful to Ms. Jane Myers and Mr. William Lawson of the United States Patent and Trademark Office; Messrs. Paul Claus and Yves Lonergan of the World Intellectual Property Organization; and Messrs. D. Dickinson and N. Fux, and Ms. S. Schiessler of the European Patent Office for their considerable assistance in promptly furnishing research materials which were most helpful in the writing of this paper.

> He who receives an idea from me, receives instructions himself without lessening mine; as he who lights his taper at mine, receives light without darkening me. That ideas should freely spread from one to another over the globe, for the moral and mutual instruction of man, and improvement of his condition, seems to have been peculiarly and benevolently designed by nature.
>
> Thomas Jefferson[1]

INTRODUCTION

History has shown that it is in the nature of mankind to learn the ideas of others, to benefit from their use, and, in many instances, to improve upon them. The advisability of using the teaching of those that have already solved a particular problem is reflected in the proverbial admonition, "Don't reinvent the wheel."[2] Laboring over the solution to a problem which has already been satisfactorily solved by another is popularly understood to be a wasteful use of one's talents. It is better, or at least more efficient, to direct inventive energies toward improving upon a given solution, or devising a solution to an entirely different problem. Not only do ideas and information spread, but the value of the ideas and information is often enhanced as they pass from one to another.

This paper focuses upon how patent documents[3] can be an integral part of the process by which scientists and engineers learn from the teachings of others. More particularly patent documents are a valuable source of technical information for advancing the understanding of a given technological art. In addition to discussing the intrinsic value of the information therein contained, this paper also discusses the ways in which patent documentation is made accessible. More particularly, the discussion highlights some recent developments in information storage and retrieval technology--such as the advent of Compact Disc-Read Only Memory (CD-ROM) and on-line data accessibility. Such advancements have greatly improved the availability of patent documentation so that it is a viable, indeed convenient and economical, information resource. The paper concludes with a discussion of the role of the World Intellectual Property Organization (WIPO) and the International Patent Documentation Center (INPADOC) of the European Patent Office (EPO) in the dissemination of patent documentation, especially to developing countries.

PATENTS AS A SOURCE OF TECHNOLOGY INFORMATION

Academic textbooks, scholarly treatises, journal articles, and the like, are well known to scientists and engineers as important sources of technological information. In addition to these more traditional sources of information, patent documents, which are published by and available through many patent offices around the world, likewise contain detailed technological information. Unfortunately, patents may be overlooked as an information source.[4]

Nonetheless, patents are a rich source of information, which can be highly valuable in teaching the state of a given technological art, and thereby contribute to invention and innovation. One author has stated,

"Technological information is the lifeblood of the innovative and inventive process and patents are also the vital source for such purpose. Patents should be an integral part of any data base from which relevant items are selected in the provision of both current awareness and retrospective searches. There is a need for change in the attitude of scientists and engineers towards the patents. The academic training of technologists and scientists should be similarly oriented to make them rely equally on patent literature along with journal articles."[5]

Clearly, patents can serve a very useful role in providing current information to those attempting to understand a given technology.[6]

There are a number of key reasons why patents are a valuable source of technical information. Firstly, a fundamental prescription of patent systems around the world[7] is that in order to be granted a patent, the applicant must disclose the invention with sufficient clarity and completeness that the invention could be carried out by a person skilled in the art to which the invention relates.[8] In fulfilling this requirement applicants must usually disclose at least one mode, and possibly even the best mode, of carrying out the invention.[9] That disclosure is often accompanied by a set of drawings, which aid in the description of the invention.[10] Because patent laws squarely place an obligation on the applicant to disclose the invention in a manner that would enable others to practice the art, those skilled in the art can consult patents and gain practical insights into the technology.

Another reason patents are a valuable source of technological information is that the patent application will include a discussion of the background art which is useful for understanding the invention.[11] Often patent drafters address this aspect of the patent disclosure by describing a particular problem, the drawbacks of other solutions to the problem, the inventor's solution, and the advantages resulting from that solution.[12] By consulting patent documents for technical information, one gets a concise summary of the state of the art with the invention placed in a historical context. Additionally, because each applicant is required to clearly and concisely claim the matter which comprises the invention,[13] the patent distinguishes the new from the old by highlighting the inventor's advancement of the technology.

A further requirement for the granting of a patent, which makes patents valuable sources of technological information, is that the invention must be new and it must involve an inventive step.[14] These statutory provisions insure that the patented invention was not within the public domain before the effective date on which the patent application was filed.[15] Once having conceived the invention or reduced the invention to practice, the threat of the loss of rights due to public disclosure of the invention by some other source motivates inventors to promptly file for a patent. Consequently, patent documents will generally reveal information which is at the forefront of the given area of technology.[16]

In addition to being a source for the timely disclosure of technology, patent documents are often the only source of disclosure of important

scientific or engineering information. Studies show that approximately 70%, or more, of what is disclosed in patent documents is not revealed in other publicly available sources.[17] Neglecting the information in patents can therefore disadvantage the researcher, insofar as he or she could be failing to consult a unique source of significant information. Without that information, the researcher may expend considerable efforts working on a problem to which there is already an acceptable solution.[18]

Patent laws also require that the invention be industrially applicable,[19] which insures that it has some utility. Frequently, the patent will include not simply concepts, but also detailed information on the possible practical applications of the invention.[20] Moreover, the expense associated with securing and maintaining a patent will generally insure that the invention has some perceived value, otherwise the patentee would not incur that expense. Patents therefore include relevant technological information, which will have a practical utility for members of the engineering and scientific communities.

THE ACCESSIBILITY OF PATENTS AS AN INFORMATION SOURCE

Patent documents are inherently valuable to the scientist and engineer because of the technical information they contain. However, due to the sheer volume of patent documents published around the world each year,[21] their value as an information resource would be greatly diminished if they could not be conveniently and efficiently accessed by those interested in using them.

Fortunately patent documents are cataloged in a manner that is designed to facilitate their easy access. Ease of accessibility is due in part to the classification of documents within the given patent system, and also to the typically uniform format by which individual patent documents tend to be structured. Accordingly, an individual who is familiar with general research techniques can quite handily access documents within the system, and then quickly assess the usefulness of a given document.

Naturally, the first concern of the researcher interested in using patents is how to access the system, generally. The classification of patents, according to their respective areas of technology, is the means by which individual documents are cataloged, and therefore accessed.[22] Using a variety of search aids,[23] the researcher can find the class and subclass in which the given technology is cataloged. Frequently, a given technology area may be cataloged in more than one class or subclass, which may make the research project somewhat more complex, but still manageable. Having located the appropriate classes and subclasses, the researcher can then retrieve the individual documents within the class or subclass for review.[24]

The researcher is further assisted by the fairly uniform format by which standard information is presented in the patent.[25] Patent formats include a title,[26] an identification of the technical field to which the invention relates,[27] a discussion of the background art,[28] a description of the invention with reference to the background art,[29] an explanation of the invention by reference to examples, where appropriate, and by reference to the drawings,[30] and finally the claims.[31] In addition, patents typically have an abstract which contains a concise description of the invention, sometimes including a drawing or figure.[32] Abstracts are often translated into a

number of different languages; therefore, even if the patent is in a language which is not understood by the researcher, a translation of the abstract may be. Particularly, by reference to the title and the abstract the researcher can easily and accurately determine whether the patent document is relevant.

Patent documents additionally contain so-called bibliographic data that provides useful peripheral information. For example, the bibliographic data typically includes an identification of the inventor, the assignee, if any, the filing date, the publication date, and the issue date.[33] Such information can assist the researcher in determining the vintage of the technology involved, which may have a direct bearing on its usefulness. It can also assist the researcher in locating the inventor or assignee, if direct discussions relating to the invention are necessary or desirable, perhaps to obtain a license to avoid infringement. Such information also provides an indication of which individuals or corporate entities are involved in particular areas of technology.

The bibliographic data might further include, in addition to a national classification, the international classification of the invention. Using the classification, a searcher could further refine a search by narrowing the examination to: patents in a particular country; patents in a particular language; or patents which belong to a specific assignee.

The bibliographic data often also includes references to other patents and prior art documents which were considered by the patent examiner in connection with the examination of the patent application. Using the listed references, a searcher may obtain other patents and nonpatent literature, such as technical publications, articles and other documents, which might be relevant in the context of the particular invention in question. It is also possible to determine whether a given document has been cited as a reference in subsequently published patent documents, which further expands the linkwork of successive publications. All such information can be invaluable to the researcher in efficiently ferreting out the other documents which contain related, technology information. In addition, through the use of the cross-references, the researcher can develop a confidence that all, or virtually all, related sources of information have been consulted.

The documents that comprise the data collection of a given patent office are generally, publicly accessible at the central patent office in any given country. So too are the various search aids that assist in finding relevant documents. To the extent that the central patent office of a given country will be physically accessible to only a small percentage of the residents of the country, and an even smaller percentage of the world community, many patent offices are committed to the dissemination of patent information by expanding the availability of the documents through a number of different methods.[34]

For example, within a given country there may be a number of patent depository libraries which are geographically dispersed so that persons in other regions of the country will have access to many, but not all, of the same documents contained in the central patent office's collection.[35] In order to achieve worldwide distribution, the central patent office of one country may have exchange agreements with other countries through which they respectively exchange documents.[36] Through this distribution system, patent documents are made more accessible.

Although patent offices around the world may be strongly committed to improving the availability of patent documents to their own citizens and the world community, historically there have been significant impediments to the achievement of this objective. Traditionally, patent documentation was accessed manually using paper copies, microfilm, or microfiche. The searcher scrutinized abstracts or full texts in order to locate patents that were of interest. Thus, the search process was performed manually, and was understandably slow. In addition, unless the searcher was geographically situated close to the central patent office, or a depository library, accessibility was limited.

TECHNOLOGICAL DEVELOPMENTS IMPROVING DOCUMENT ACCESSIBILITY

There are presently a wide variety of data bases[37] which contain information covering patent documents. Recent technology developments have enhanced the means by which the information contained in the data bases is made available on both a local and remote basis. The availability of these improved sources and access services continues to spread. Two important technological developments which have improved the availability of patent documents are on-line access to computer-stored data bases and access through CD-ROMs.[38]

So-called "on-line" access to computer-stored data bases refers to access over some type of telecommunications network. Such data bases are made accessible to subscribers of the given on-line service by the private entity which makes the service available.[39] Subscribers to the service may be charged one time or annual subscription fees, as well as actual use fees which are computed on the basis of the amount of time one is actually connected to the on-line resource, not unlike a typical telephone charge.

Typically, an on-line data base enables the searcher to direct the inquiry to the various items of bibliographic data, such as inventor's name, patent owner, title, abstract, classification, filing date, or publication date. Therefore, if a researcher was not familiar with the most relevant classification of the technology which needs to be searched, these other data fields can be searched to identify one or more patents in the target area of the search.

In addition to accessing data bases on-line, the same or other data bases can be stored and accessed on CD-ROM.[40] A CD-ROM provides a very convenient, compact, electronic medium for storing relatively large amounts of information in word searchable form. For example, about 1,000 U.S. patents could be stored in full text and image form on a single CD-ROM disc. In their protective plastic cases, 100 CD-ROM discs storing about 100,000 U.S. patents could be housed in less than three-and-a-half feet of shelf space.[41] The use of CD-ROMs requires a PC-AT computer, a high resolution screen, a CD-ROM drive and printer. The printing of facsimile images will require a laser printer.

CD-ROMs are available which contain full bibliographic information, text and drawings in facsimile form, facilitating local reproduction of individual copies in a quick, inexpensive manner. At present, the availability of such CD-ROMs is limited to U.S., EPO, PCT, German and U.K. patent documents.[42] Also available are CD-ROMs containing bibliographic information, abstract and

representative drawings in facsimile form, or bibliographic information only. Naturally, the type of information on a given CD-ROM will determine the limits of the search one is capable of performing using that resource.

SOME ON-LINE AND CD-ROM SEARCHING TECHNIQUES

It should first be noted that although patent documents can be accessed and searched through a variety of known data bases all over the world, the consistency and value of the search results depend heavily on the limitations of the data base and the manner of searching. Additional variables affecting the search relate to the peculiarities and the features of the accessed patent system, and the specific kinds of patents being accessed.[43]

Nonetheless, the availability of patent information on CD-ROMs and on-line data bases provides alternatives to local searching. For example, using CD-ROMs, a local search and retention facility can be set up to permit full text document reproduction without incurring the expense associated with accessing on-line data bases. Searches can be conducted using CD-ROMs containing only bibliographic data, titles and/or abstracts to locate patents of interest. CD-ROMs storing full images can then be used to provide screen displays or hard copy full text and drawings of those patents. One disadvantage of this approach is that despite their storage capacities, several CD-ROMs may need to be searched to cover a desired period or range of patents, thus slowing down the search process.

Alternatively, a search could be conducted using an on-line data base service to identify patents of interest from one or more data bases. Once those patents are identified on-line, one could then access those patents from a full text/image CD-ROM and reproduce the complete patent. This approach facilitates a more comprehensive search over a range of patents from various sources while minimizing the expense through local reproduction and review of full text copies.[44] However, the cost of accessing on-line data bases over international data links could be quite significant.

THE ROLE OF WIPO AND INPADOC

The World Intellectual Property Organization (WIPO) plays a central role in promoting the use of patent documentation as a source of technological information. For example, WIPO has promoted the free exchange of patents and related publications amongst patent offices all over the world. Patent publications both in paper form and in microform are exchanged under various arrangements, with the flow of information designed to address the needs of developing countries.[45]

Additionally, WIPO has assisted the patent offices of some countries and organizations, such as those of Brazil and the African Intellectual Property Organization, to modernize the documentation of their information and records. WIPO has periodically arranged training courses in the use of technological information contained in patent documents, and representatives from developing countries are invited to attend such courses.

WIPO has a Permanent Committee on Patent Information (PCPI). PCPI has periodically arranged sessions where several members have participated. PCPI comprises working groups which provide information to developing countries on

requested searches, general information, and standards. Also, WIPO has a program to provide to developing countries state-of-the-art searches covering the technology in a requested area. This service relies upon the assistance of several donor countries, such as Germany, Sweden, Austria, which have contributed time and energy to this effort.

WIPO has also published guidelines for the establishment of regional patent information and documentation centers (PIDCs), which could promote the dissemination of technological information to developing countries. The document, which is entitled "Guidelines for the Organization of a Patent Information and Documentation Center," was updated in 1987. The two objectives of the guidelines are first, to facilitate "the access of developing countries to technical information already existing in documents such as those concerning patents and other information important to the transfer and use of technology," and second, to encourage developed countries to "make available in a systematic manner, in accordance with their national laws and regulations, the results of their research and development relevant to the social and economic development of developing countries."

WIPO has also published the so-called INID code which pertains to "Recommendation concerning bibliographic data relating to patent documents," and a user-oriented guide to the International Patent Classification system. The guide includes four key sections of interest to developing countries, namely iron and steel, fertilizers, agro-industries, and agricultural machines and implements, for obtaining solutions to certain technical problems.

In addition to WIPO, a comprehensive international referral service relating to patent documentation is provided by the International Patent Documentation Center (INPADOC) located in Vienna. INPADOC was created in 1972 under an agreement between WIPO and the Republic of Austria. It is now operated as part of the Patent Information Directorate of the EPO.

INPADOC stores and updates basic bibliographic data on the published patent documents of a large number of countries, organizations, or other entities.[46] The bibliographic data processed and stored by INPADOC is available to government authorities and the public. Due to the comprehensiveness of the bibliographic data, documentation pertinent to specific technical categories can be located, and also all corresponding patent documents filed for the same invention. Using this information, and the link established by the common convention priority date, a "family" of patents can be identified.[47] Once the members of the family of patents are identified, it can be determined whether the patent is available in a given language. Also, the number of members in the family, which is determined by the number of different countries in which the patent was filed, will give some indication of the perceived importance of the invention.

In addition, INPADOC presently makes available a Patent Register Service (PRS) giving information on the legal status of patent applications and granted patents for 12 countries and organizations.[48] Also the INPADOC Patent Gazette (IPG) is published weekly, comprising four indexes: a numerical index; an IPC symbol index; an index of names of applicants and owners; and an index of inventors' names. Each index contains references to all patent documents entered in the INPADOC data bank during the proceeding week. Users can thereby readily monitor developments in a particular

technical field, or the activities of a given firm, enterprise or inventor. INPADOC bibliographic data and legal status data for patent documents are available on microfiche and tape while the IPG is available on microfiche.

CONCLUSION

Patents are a well indexed and well classified source of technological information. They can therefore be beneficially used by individual researchers, corporations, research and development organizations, universities, governments, and others, to learn the technology revealed therein. Patent documentation can also be a useful tool for planning development, allocating funding, and producing statistical information. Whereas patent documentation has traditionally been an under-utilized information resource, perhaps due to its more remote accessibility, modern technology has greatly enhanced its availability. Moreover, accessibility is made even easier due to organizations, such as WIPO, which are chartered to improve the wide distribution of patent documentation and the dissemination of technological information. To the extent that the course of history amply demonstrates the value of learning from the teachings of others, it would certainly be undesirable for patents to remain an overlooked source of technological information, especially by developing nations.

ENDNOTES

[1] Six Writings of Thomas Jefferson, H.A. Washington Ed. (1854), pp. 180-181.

[2] Recognizing the value of learning from others has often been metaphorically stated in terms of the person standing on the shoulders of a giant is able to see even further than the giant himself. For example, Samuel Taylor Coleridge said, "The dwarf sees farther than the giant, when he has the giant's shoulders to mount on," The Friend, section i, Essay 8. And, Sir Isaac Newton said, "If I have seen further it is by standing on the shoulders of giants," Letter to Robert Hook, February 5, 1675/76.

[3] Unless otherwise noted, throughout this paper the term "patent documents" includes all published patent documents and patent-related publications. Typically, such documents and publications would include: utility patents, patents of addition or improvement, dependent patents, patents of importation (revalidation, confirmation and introduction), inventors' certificates, precautional patents, secret patents when published, reissue patents, plant patents, petty patents, registrations and design patents.

[4] L.O. Aina, "The Use of Patent Literature By Nigerian Scientists," Inspel, Vol. 23(3), 1989, pp. 164-169, hereinafter cited as "Aina," at p. 168; D. Chester, "Getting Benefits From Patents," Lasie, Vol. 15, No. 2, September/October 1984, pp. 2-11, at 8-9; Sophie K. Hudnut, "Patents as Information Sources," Online '82 Conference Proceedings, pp. 1-11, hereinafter

cited as "Hudnut," at p. 1; Sudarshan Kumar, "Patents as Source of Technological Information," Herald of Library Science, July-October 1984, pp. 175-182, hereinafter cited as "Kumar," at p. 180; William S. Lawson, "Patents as a Source of Technological Information," paper accompanying presentation in Chicago, Ill., on December 1, 1979, pp. 1-15, hereinafter cited as "Lawson," at p. 6; and Susan M. Tertell, "Patents Are an Overlooked Information Source," Bulletin of the American Society for Information Science, October/November 1986, pp. 24-25, hereinafter cited as "Tertell," at p. 24.

[5] Kumar, note 4 supra, at p. 181.

Another author has stated,

"As a source of technological information across the whole spectrum of technology, the collection of patents has no equivalent. To researchers it can be a rich source of current state-of-the-art information, new ideas, and problem-solving technology, all of which may lead to more productive research and development. Patent documents are a vital information source which should be consulted before an industrial enterprise, research and development laboratory or an individual engages in costly and time-consuming experiments with the objective of developing a new patentable product."

Chester, note 4 supra, at p. 4.

Citing Eckhard Derday, a third author has said,

"According to Derday (1985), the technological information contained in patent documents is very crucial in the field of innovation, and since the growth of any national economy is largely influenced by the degree of its innovativeness, the full exploitation of patent information becomes obvious. Derday further emphasized that patent information is a unique instrument for the transfer of technical knowledge from developed to developing countries."

Aina, note 4 supra, at p. 164.

[6] In certain instances, however, there are limits to the technological information that can be found in patents. For example, the patent statutes of some countries have listings of subject matter which is considered nonstatutory. Most countries limit patentable subject matter to inventions of a technological nature. Examples of subject matter which is nonstatutory in certain countries include inventions relating to national security, medicines, pharmaceutical products, scientific principles (computer programs), food, as well as inventions contrary to law or morality, or injurious to health. These exclusions are often based upon the given country's perceived need to promote unrestricted technological development, resulting in the exclusion of the granting of exclusive monopolies in certain fields. In India, for instance, substances per se relating to or produced by chemical processes (including alloys, optical glass, semi-conductors and intermetallic compounds) are non-patentable. However, methods or processes for producing such substances are patentable for a relatively short term.

On the other hand, there may be countries where a patent application for nonstatutory subject matter is preliminarily published, but not patented. Consequently, preliminary patent publications could serve as exceptionally good sources of technological information.

[7] In discussing the requirements of patent systems around the world, rather than offering a sampling of the patent laws of a number of specific countries, throughout this paper the authors will refer to the provisions of "The 'Basis Proposal' for the Treaty and Regulations," compiled by the Diplomatic Conference for the Conclusion of a Treaty Supplementing the Paris Convention as Far as Patents Are Concerned, WIPO document PLT/DC/3, December 21, 1990, and hereinafter cited as "Draft Harmonization Agreement." Additionally, the authors will refer to the draft "Agreement on Trade-Related Aspects of Intellectual Property Rights, Including Trade in Counterfeit Goods," draft version released by GATT Director General, Arthur Dunkel, on December 20, 1991, MTN.TNC/W/FA, pp. 57-90, hereinafter cited as "Draft TRIPS Agreement." The authors have elected to refer to these two documents because to the extent that the drafts are a culmination of many years of international negotiations focused upon the harmonization of patent and intellectual property laws, they reflect a degree of consensus by the international community on the purpose, content and format of patents. Furthermore, a review of the general principles and requirements reflected by the draft treaty and agreement provisions cited in this paper will reveal these principles and requirements are generally implemented, in one form or another, in the various national patent laws around the world.

[8] Draft Harmonization Treaty, note 7 supra, Article 3(1)(a); and Draft TRIPS Agreement, note 7 supra, Article 29(1). Mandating the disclosure of the invention so that the rest of society can benefit from the teaching contained in the disclosure is generally regarded as the quid pro quo for the exclusive rights granted to the inventor through the patent.

[9] Draft Harmonization Treaty, note 7 supra, Rule 2(1)(vi), and Draft TRIPS Agreement, note 7 supra, Article 29. International patent applications filed under the Patent Cooperation Treaty (PCT), for example, are generally required to include a description of performing the invention in the best mode (Rule 5.1(a)(v)). Thus, patents filed in countries requiring the disclosure of the best mode will likely contain more complete information than patents from countries without a best mode requirement.

[10] Draft Harmonization Treaty, note 7 supra, Rule 2(1)(v).

[11] Id. Rule 2(1)(ii). Also see "General Introduction to the Use of Patent Documents and the Technological Information Contained Therein," prepared by the International Bureau of WIPO, Doc. WIPO/PD/SOF/90/1, dated October 1990, hereinafter cited as "WIPO Introduction," at p. 21.

[12] Draft Harmonization Treaty, note 7 supra, Rule 2(1)(iii).

[13] Id. Article 4(2) and (3), and also see Rule 3(2) stating that "[t]he definition of the matter for which protection is sought shall be in terms of the technical features of the invention."

[14] Id. Article 10(1) of Alternative A and Article 11(1), and Draft TRIPS Agreement, note 7 supra, Article 11(1). Also see WIPO Introduction, note 11 supra, at p. 7.

[15] Draft Harmonization Treaty, note 7 supra, Article 11(2)(b). Many countries today have absolute novelty requirements for inventions to be

patentable. To meet this requirement, the invention should not have been made part of public knowledge prior to the date of patent application. In other words, the invention cannot have been divulged to the public by an act--such as public use, non-privileged disclosure, publication, sale, or manufacture --anywhere in the world, such that one skilled in the art would be able to practice the invention from information obtained from the act. Other countries, such as Japan and the U.S., have relative novelty requirements whereby pre-filing publication of the invention anywhere in the world can result in the loss of novelty, but in order for a public use to result in the loss of novelty it must occur within the country. In the United States inventors are also given a one-year grace period during which they may file a patent application even after public disclosure or use. See 35 U.S.C. sec. 102(b). In Japan, Article 30(1) of the Patent Law provides a six-month grace period in respect of printed publications (and certain other written disclosures) of the invention attributable to the applicant, provided written request for the application of Article 30(1) is made when the application is filed. Because failure to file within the grace period will result in a loss of rights, even under the relaxed standards of a relative novelty country, there is, nonetheless, motivation to file for a patent promptly.

[16] WIPO Introduction, note 11 supra, at p. 7.

[17] Chester, note 4 supra, at p. 5; Hudnut, note 4 supra, at 1; Lawson, note 4 supra, at 6; and Tertell, note 4 supra, at 24; WIPO Introduction, note 11 supra, at p. 8.

[18] One author states that international studies have estimated that at least 10% of all R & D expenditure is a duplication of what could have been determined through a patent search. This translates into the waste of approximately 100 million R & D dollars per year in Australia. Chester, note 4 supra, at p. 6.

[19] Draft Harmonization Treaty, Article 10(1), Alternative A, and Draft TRIPS Agreement, Article 27, note 7 supra.

[20] WIPO Introduction, note 11 supra, at p. 8.

[21] A report of the World Intellectual Property Organization reveals that in 1990, the year for which the most current data is available, the total number of patents applied for in the 82 nations covered by the report was 1,663,280. During that year the total number of patents granted in the 82 nations was 548,304. Intellectual Property Statistics 1990, WIPO Publication, Doc. IP/STAT/1990/A (Publication A).

Focusing upon the United States, for example, statistics of the United States Patent and Trademark Office (USPTO) reflect the trend toward more patents being applied for and granted, suggesting that an increasing amount of technical information is revealed in patents.

Year	No. of Applications*	No. Granted Patents*
1985	117,006	71,661
1986	122,433	70,860
1987	127,917	82,952
1988	139,825	77,924
1989	152,750	95,539
1990	164,558	90,366

* Figures only relate to utility patents.

During the fiscal year ending September 30, 1991, the USPTO had granted 92,474 utility, plant, and reissue patents.

In addition to patents, patent offices also collect and index other publications, which are used in prior-art searches, along with the patents. Again referring to the USPTO, statistics reveal the daunting volume of documents that are added to the collection of just one patent office. For example, during the years shown, the USPTO added the following U.S. and non-U.S. documents to its collection.

Year	U.S. Docs.	Non-U.S. Docs.
1985	285,000	359,000
1986	291,000	373,000
1987	353,000	363,000
1988	506,000	378,000
1989	436,000	381,000
1990	458,000	512,000

Patent Type Summary Report as of December 31, 1990.

As of December 31, 1991, the USPTO housed a total of 31 million U.S. and non-U.S. documents, comprised of patents and other printed publications.

Finally, although it is not known precisely how many patent documents have been published in toto, estimates place the number at about 30 million, with an additional one million patent applications and granted patents being added each year. WIPO Introduction, note 11 supra, at pp. 6-7; Chester, note 4 supra, at p. 8.

[22] Presently, over 50 countries apply the International Patent Classification (IPC) system to their patents. Also, as of January 1990, the IPC divided technology into 8 sections, 118 classes, 616 subclasses, 6,871 main groups and 57,324 subgroups, for a total of 64,195 divisions or subdivisions. "The International Patent Classification (IPC), Its Philosophy and Use," prepared by the International Bureau of WIPO, Doc. WIPO/PD/SOF/90/2, dated October 1990, hereinafter cited as "WIPO Classification," at pp. 4 and 6. Also see WIPO Introduction, note 11 supra, at pp. 10-12. Current versions of the IPC are available in English and French. There are also translations into other languages, such as Chinese, German, Hungarian, Japanese, Korean, Polish, Portuguese, Spanish, and Thai, which makes the use of IPC relatively economical and simple for use by searchers from developing and industrialized countries alike. It is estimated that more than 90% of the patent documents in the world bear the IPC symbols and can be accessed therefrom.

In addition, the patent system in a given country will also have its own classification system, and there are naturally variations in their respective levels of sophistication. As of January 1992, the United States Patent Classification System has 415 classes and 127,194 subclasses for its patent documentation. Issued U.S. patents include within the bibliographic information the appropriate U.S. Patent Classification numbers as well as International Patent Classification (IPC) numbers.

The European Classification (ECLA) is a variation and an extension of the IPC developed by the European Patent Office. The ECLA system comprises 65,000 subdivisions of the IPC and additionally 39,900 more detailed subdivisions.

There are also private entities which have developed their own classification system. For example, the Derwent classification system, developed by Derwent Publications Limited, is well organized and continually updated. Derwent provides instruction manuals and a World Patent Index comprising listings of patent documents from 30 countries/groups including EPO and PCT. The system also provides views of trends in technological innovation through patents statistical analysis. Derwent has international branches which allow access to its data base from one of several geographic locations in the world.

Conversion tables for interconnecting patent classification systems of different countries have been developed, but are not as effective as would be desired by a modern searcher or user, because of the diversity in the approach to the classification by different countries.

[23] The searching of patents classified according to the IPC is accomplished by reference to a guide which explains the layout, use of symbols, principles, rules and application of the IPC, as well as a survey of the classes and a summary of the main groups. WIPO Classification, note 22 supra, at p. 5.

In the United States the Index to the U.S. Patent Classification gives an alphabetical listing of subject matter headings or descriptions. Additional sources such as the Manual of Classification contains the classification schedules, while the U.S. Patent Classification Definitions gives a detailed definition of what is included in or excluded from a particular classification, adding useful search notes. Also see Hudnut, note 4 supra, at p. 5; Lawson, note 4 supra, at p. 11; and Tertell, note 4 supra, at pp. 24-25.

Yet another information tool available in the United States is the Official Gazette (OG), which is published weekly by the USPTO, and contains a summary of each patent issued during the week, arranged according to the subject matter of the patent. Typically, the OG entry for a given patent will contain the abstract of the invention and a representative illustration of the invention taken from the patent.

[24] The U.S. Patent Classification Subclass Listing lists the patent numbers which fall within a certain classification so that the researcher can then retrieve the documents. See Tertell, note 4 supra, at p. 25.

[25] WIPO Introduction, note 11 supra, at p. 7.

[26] Draft Harmonization Treaty, note 7 supra, Rule 2(1).

[27] Id. Rule 2(1)(i).

[28] Id. Rule 2(1)(ii). A description of the background art is commonly found in the patents of most countries, even though the inclusion of such is not always mandated by statute. There are, however, patent systems which require the discussion of relevant prior art in sufficient detail. The European Patent Convention is an example of one such system. Rule 27, chapter II, Provisions Governing the Application, Implementing Regulations to Part III of the European Convention.

[29] Id. Rule 2(1)(iii).

[30] Id. Rule 2(v) and (vi).

[31] Id. Article 4. There are patent systems which permit the filing of provisional patent applications with no claims, to be followed by a complete application with claims. If no complete application is filed on time, the provisional application, without claims, might be published, laying open the complete specification. For example, such a system exists in the United Kingdom. In any event, a searcher must be aware that for an unexpired patent the onus not to infringe is upon the user of the information.

[32] WIPO Introduction, note 11 supra, at pp. 8 and 13. Also, information on abstracts may be obtained from the following sources:
- The Japanese Patent Office, Chiyoda-Ku, Tokyo, Japan.
- Derwent Publications Ltd., Rochdale House, 128, Theobalds Rd., London WC1X 8RP, United Kingdom.
- Chemical Abstracts Service, Ohio State University, Columbus, Ohio 43210, United States of America.

[33] Id. Article 6(1), and also see WIPO Introduction, note 11 supra, at p. 8.

[34] William S. Lawson, "USPTO Perspectives--Use Automation Products Available from USPTO," hereinafter cited as "Lawson Perspectives," for presentation at AIPLA mid-winter meeting, January 1992, at CI2, describing the mission of the USPTO.

[35] In the United States, for example, there are presently over 70 patent depository libraries in 45 states and the District of Columbia. See Lawson Perspectives, note 34 supra, at CI2.

[36] The United States has such exchange agreements with approximately 35 other countries resulting in the USPTO annually sending out a total of 51 sets of U.S. documents, either on paper or on microfiche. Given that the USPTO publishes on the order of 100,000 documents per year, over 5,000,000 patent documents are distributed around the world by the USPTO annually.

[37] Generally, a data base is a collection of information which pertains to a given subject area or topic, and the individual records within the data base are uniformly formatted so that each record contains the same type of information, though obviously not the same information, for each entry. Examples of data bases for patent documents, and the type of information contained in each data base are given in Appendix A.

[38] Lawson Perspectives, note 34 supra, at CI6-CI10; Tertell, note 4 supra, at p. 25.

[39] Examples of such private parties which provide on-line services are Dialog, Orbit, Patolis, and STN. Also see Appendix A for a selected listing of the data bases which they respectively provide, and their addresses and telephone numbers.

[40] A selected listing of CD-ROM products and the sources that make the products available are shown in Appendix B.

[41] Lawson Perspectives, note 34 supra, at CI8.

[42] Lawson Perspectives, note 34 supra, at CI10.

[43] For example, searchers should be aware that applications filed under the European Patent Convention (EPC) or the Patent Cooperation Treaty (PCT) will typically result in national applications/patents in designated countries. EPC/PCT applications are however subject to preliminary publication about 18 months after the priority date of the respective application. Such preliminary publications also are documented and stored in data bases and can be accessed during a search. EPC/PCT applications in the course of their prosecution enter the national stage, and, if granted, culminate in national patents which are documented and classified just like other national patents, by interested agencies, e.g., patent offices, WIPO and other data bases. The searcher will be able to observe the differences, if any, in the text and other portions of the preliminary publication as compared with those in the final granted patent.

[44] By way of example of the practical use of these on-line and CD-ROM resources, the Law Department of Digital Equipment Corporation in Maynard, Massachusetts, USA, currently uses on-line data base services to locate English language equivalents of non-English language patents, such as prior art references cited in patent office search and examination reports. Also under consideration is the expanded use of on-line patent data bases and CD-ROMs for retroactive searching purposes, such as evaluating the novelty of invention disclosures as part of a decision-making process prior to filing the patent application. CD-ROMs offer an attractive basis for self-contained on-site bibliographic and abstract searching and full text patent documentation retrieval, particularly for USPTO and EPO patent documentation. However, CD-ROM abstract searching currently is of limited value because CD-ROMs containing abstracts are available only for the past few years. For example, CASSIS/BIB contains only abstracts for the most recent previous three years while ESPACE CD-ROM products do not extend back before 1989.

[45] One method by which patent documentation could become more accessible in developing countries is through the creation of Patent Information Document Centers (PIDCs) under guidelines published by WIPO. It seems desirable for WIPO to start PIDCs in developing countries where a PIDC does not exist and thus get the local government involved in technology acquisition/transfer efforts according to need.

[46] Those countries, organizations, or other entities are: Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, China, Cuba, Cyprus,

Czechoslovakia, Denmark, Egypt, Finland, France, Germany, Greece, Hungary, India, Ireland, Israel, Italy, Japan, Kenya, Luxembourg, Malawi, Malaysia, Mexico, Monaco, Mongolia, Netherlands, New Zealand, Norway, Philippines, Poland, Portugal, Republic of Korea, Romania, Russian Federation, South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States of America, Vietnam, Yugoslavia, Zimbabwe, the African Regional Industrial Property Organization (ARIPO), the European Patent Office (EPO) (applications for European patents), the International Bureau of WIPO (international applications under the PCT). The UK patents registered in Hong Kong and Singapore are also recorded.

[47] Once a searcher locates a patent document using its classification, by calling the family of patent documents all of which relate to the same priority document, the patent document of a particular language or a particular country can be identified. The researcher should be aware, however, that unless the data base includes non-convention countries, it is likely that the patents in the non-convention countries, such as Taiwan, India, and Pakistan, would not be included in the family listing.

[48] Those countries or organizations are: Austria, Belgium, Switzerland, Germany, Denmark, France, United Kingdom, Hungary, Netherlands, United States of America, EPO, WIPO.

APPENDIX A - ON-LINE SERVICES

The following is a selected listing of several data bases and a brief statement of the scope of the contents of each. Also listed are the source entity responsible for maintaining the data bases, as well as the on-line service through which the data base is accessible. With respect to the source entities and each on-line service, the address and telephone numbers are provided. Address, telephone, and FAX numbers are also included for providers of the on-line services.

Data Bases

INPADOC
This data base contains bibliographic information for patent documentation from over 50 countries and organizations. The source is the European Patent Office, and it is available on-line through DIALOG, ORBIT, STN and PATOLIS.

JAPIO
This data base contains English language bibliographic information and abstracts of published, unexamined Japanese patent applications published since 1976. The source is the Japan Patent Information Organization, and it is available on-line through ORBIT.

WORLD PATENT INDEX
This data base contains bibliographic information, abstracts, and special subject classification codes for patent documents from 31 patent issuing authorities. The source is Derwent, and it is available on-line through DIALOG, ORBIT and QUESTEL.

Addresses and Telephone Numbers for Selected Sources

European Patent Office

Principal Directorate, Patent Information, European Patent Office, EPIDOS-INPADOC Services, Moellwaldblatz 4, Postfach 163, A-1041 Vienna, Austria (from January 20, 1992). Telephone: 43-1-5261201; FAX: 43-1-52126-1493.

Japan Patent Information Organization

Japan Patent Information Organization, International Department, Sato-Dia Bldg.; 4-1-7 Toyo, Kotu-Ku, Tokyo 135, Japan. Telephone: 81-3-5690-5555; FAX: 81-3-5690-5566.

United States Patent and Trademark Office

U.S. Patent and Trademark Office, Office of Electronic Information Products and Services, Crystal Mall 2, Room 304, Washington, D.C. 20231, U.S.A. Telephone: 1-703-557-5652.

Addresses and Telephone Numbers for Selected On-Line Services

DIALOG

Main office:
UNITED STATES OF AMERICA - Dialog Information Services, Inc., 3460 Hillview Avenue, Palo Alto, CA 94304. Telephone: 415-858-3785; FAX: 415-858-7069.

Other offices:
ARGENTINA - In/Base Argentina S.A./DIALOG, Paraguay 1345, Piso 8, Of. C-D, Buenos Aires. Telephone: 54-1-814-4258; FAX: 54-1-814-4258.

AUSTRALIA/NEW ZEALAND - Insearch Limited/DIALOG, P.O. Box 123, Broadway, Sydney, NSW 2007. Telephone: 61-2-212-2867; FAX: 61-2-281-5427.

BRAZIL - PTI/DIALOG, Publicacoes Tecnicas Internacionais Ltda., Rua Peixoto Gomide 209, 01409 Sao Paulo SP. Telephone: 55-11-257-2157; FAX: 55-11-258-6990.

CANADA - Micromedia Ltd./DIALOG, 158 Pearl Street, Toronto, Ontario M5H 1L3. Telephone: 416-593-5211; FAX: 416-593-1760.

CHILE - Empresa Nacional de Telecommunicaciones, S.A./DIALOG, (ENTEL-CHILE), Santa Lucia #360, Piso 8, Santiago. Telephone: 56-2-71-21-21; FAX: 56-2-690-2638.

DENMARK - DataArkiv/DIALOG, Glentevej 65, DK-2400 Copenhagen NV. Telephone: 45-38-33-52-10; FAX: 45-31-19-93-51.

FINLAND - Esselte Micromedia/DIALOG, Italahdenkatu 22 BA, 00210 Helsinki. Telephone: 358-0-692-6419; FAX: 358-0-692-7820.

FRANCE - Learned Information/DIALOG, 75 avenue Parmentier, 75011 Paris. Telephone: 33-1-40-21-24-24; FAX: 33-1-40-21-24-00.

GERMANY - EXIT Datenbankdienste/DIALOG, Graf-von-Stauffenbergstrasse 19, D-4800 Bielefeld 1. Telephone: 49-521-16-10-21; FAX: 49-521-10-99-00.

HONG KONG - Information Services/DIALOG, 50 F'Aguilar Street, Central, Hong Kong. Telephone: 852-868-0877; FAX: 852-845-0141.

INDIA - Informatics (India) PVT Ltd./DIALOG, PB No. 360, Malleswaram 11th Cross, Bangalore, India 56003. Telephone: 91-812-845-2041.

ISRAEL - Teldan Information Systems Ltd./DIALOG, 7 Derech Hasholom, Tel-Aviv, Israel 67892. Telephone: 972-3-25-00-73; FAX: 972-3-62-39-09.

JAPAN - KINOKUNIYA COMPANY LTD., ASK Information Retrieval Services, P.O. Box 55 Chitose, Tokyo 156. Telephone: 81-3-439-0123; FAX: 81-3-439-1093.

JAPAN - MARUZEN CO. LTD., MASIS CENTER, P.O. Box 5335, Tokyo International 10031. Telephone: 81-3-271-6068; FAX: 81-3-271-6082.

MEXICO - Asesores Especializados en Informacion y Documentacion, S.C., AEID/DIALOG, Ceres 43, Col. Florida, 01030 Mexico, DF. Telephone: 52-5-534-8950; FAX: 52-5-534-8950.

NORWAY - AXESS A/S/DIALOG, P.O. Box 86 Bryn, 0611 Oslo 6. Telephone: 47-2-72-12-70; FAX: 47-2-72-12-66.

REPUBLIC OF KOREA - Data Communications Corporation of Korea, Sales and Marketing Division, 10th Floor, Insong Building, 194-45, Hoehyundong 1 GA, Choong-Ku, Seoul. Telephone: 82-2-791-1114; FAX: 82-2-796-8811.

SAUDI ARABIA - Arabian Advanced Systems, AAS/DIALOG, P.O. Box 20129, Riyadh 11455. Telephone: 966-1-476-6337.

SPAIN - Editorial Garsi SA/DIALOG, Numancia, 85-87, bajo, 08029 Barcelona. Telephone: 34-93-322-99-11; FAX: 34-93-322-96-52.

SWEDEN - DataArkiv/DIALOG, Box 1502, S-171 29 Solna. Telephone: 46-8-705-1300; FAX: 08-82-82-96.

SWITZERLAND - Centredoc/DIALOG, Rue Brequet 2, CH-2007, Neuchâtel. Telephone: 41-38-205-639; FAX: 41-38-25-48-73.

UNITED KINGDOM - Learned Information/DIALOG, P.O. Box 188, Oxford OX1 5AX. Telephone: 44-865-730-275; FAX: 44-865-736354.

ORBIT
Main office:
UNITED STATES OF AMERICA - Maxwell Online, Inc., 8000 Westpark Drive, McLean, VA 22101. Telephone: 1-703-442-0900; FAX: 1-703-893-4632.

Other offices:
AUSTRALIA - Maxwell Online, Locked Bag 44, Botany, NSW 2019. Telephone: 61-2-316-9631; FAX: 61-2-316-9485.

JAPAN - USACO Corporation, 13-12 Shinbashi 1-Chome, Minatoku, Tokyo, 105. Telephone: 81-3-3502-6471; FAX: 81-3-3593-2709.

REPUBLIC OF KOREA - Samsung Co., LTd., Business Development Dept., Taepyong-no. 2-GA, Chung-gu, Seoul, Korea 100-102. Telephone: 82-2-751-2542; FAX: 82-2-751-2776.

UNITED KINGDOM - Maxwell Online, Achilles House, Western Avenue, London W3 0UA, England. Telephone: 44-81-992-3456; FAX: 44-81-993-7335.

PATOLIS

Japan Patent Information Organization, Sato Dia Bldg., 4-1-7, Toyo, Kotu-Ku, Tokyo 135, Japan. Telephone: 82-3-5690-5555; FAX: 82-3-5690-5566.

QUESTEL

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FRANCE - Questel, 55 Avenue des Champs Pierreux, 92012 Nanterre Cedex. Telephone: 33-1-46-14-55-55.

STN

Main office:
GERMANY - STN International, P.O.Box 2465, D-7500 Karlsruhe 1. Telephone: 49-7247/82-45-66; FAX: 49-7247/29-68.

Other offices:
AUSTRALIA - CSIRO Information, Resources Unit, 314 Albert Street, East Melbourne, Victoria. Telephone: 03-418-7333.

UNITED STATES OF AMERICA - STN International, 2540 Olentangy River Road, Columbus, OH 43202. Telephone: 614-421-3698; FAX: 614-421-3713.

Access to these on-line services from countries throughout the world is available through Public Data Networks (PDNs) which facilitate international data communication. PDNs are generally run by the national telecommunication authority of the country. Subscribers to a national PDN can then use international networks such as DIALNET, TYMNET or SprintNet to connect to an on-line service. DIALOG, ORBIT and STN can be accessed via TYMNET and SprintNet; PATOLIS via Venus-P.

APPENDIX B - CD-ROM PRODUCTS

The following is a selected listing of sources which maintain and provide CD-ROM products, and the contents of those products. Included with each title is a brief description of the scope of the contents of the CD-ROM, and finally a listing of the addresses and telephone numbers of each source.

CD-ROM Products of the European Patent Office

ESPACE-EP
This CD-ROM product contains the complete EPO patent specifications published since 1989. Each is stored in image form so that the text, drawings, and formulae can be reproduced exactly as the original using a laser printer. All bibliographic data on the title pages are index coded and title searches can be made in English, French or German.

ESPACE-FIRST
This CD-ROM product contains the first pages of EPO and PCT patent applications published since 1989. Each is stored in facsimile format with searchable bibliographic information and abstracts.

ESPACE-WORLD
This CD-ROM product contains the complete PCT patent applications published since 1991. Each is stored in facsimile format with searchable bibliographic information and titles.

ESPACE-ACCESS
This CD-ROM product contains EPO patent applications published since 1978. Each is stored in image form with bibliographic information on the title page index coded for searching. Searchable English language abstracts are progressively being introduced.

ESPACE-UK
This CD-ROM product contains bibliographic data (searchable) and complete facsimile images of United Kingdom patent applications (A-documents) published since 1990.

CD-ROM Products of the Japan Patent Information Organization

JAPIO
This CD-ROM product contains the full-text images of unexamined Japanese patent and utility model applications published since 1987, including bibliographic information. It is in Japanese.

CD-ROM Products of the United States Patent and Trademark Office

CASSIS/BIB
This CD-ROM product contains the U.S. classifications, assignees, titles, abstracts (most recent three years only) and patent origin (residence state or country of first-named inventor) for U.S. patents issued since 1969.

CD-ROM Products of MicroPatent

ClaimSearch
This CD-ROM product contains the full text of all claims for patents issued by the USPTO since 1975 together with bibliographic information.

FullText
This CD-ROM product contains the full text of patents issued by the USPTO since 1975. Patents can be retrieved by patent number only.

PatentImages
This CD-ROM product contains the full-text images of U.S. patents including drawings for patents issued by the USPTO since 1990, with backfiles to 1976 available during 1992.

Addresses and Telephone Numbers for the Selected Sources

European Patent Office
Principal Directorate, Patent Information, European Patent Office, EPIDOS-INPADOC Services, Schottenfeldgasse 29, Postfach 82/P.O. Box 82, A-1072 Vienna, Austria (from January 20, 1992). Telephone: 43-1-52126-0; FAX: 43-1-52126-1493.

Japanese Patent Information Organization
Japan Patent Information Organization, International Department, Sato-Dia Bldg.; 1-7 Toyo 4-chome, Kotu-Ku, Tokyo 135, Japan. Telephone: 81-3-5690-5555; FAX: 81-3-5690-5566.

United States Patent and Trademark Office
U.S. Patent and Trademark Office, Office of Electronic Information Products and Services, Crystal Mall 2, Room 304, Washington, D.C. 20231, U.S.A. Telephone: 1-703-557-5652.

MicroPatent

MicroPatent Canada - Micromedia Limitee, Mr. Gary Gibson, 265 Hôtel de Ville, Hull, Quebec J8X. Telephone: 800-567-1914; FAX: 819-770-9265.

MicroPatent Europe, Ms. Elisabeth Hearle, Cambridge Place, Cambridge CB2 1NR, England. Telephone: 44-223-311-479; FAX: 44-223-66440.

MicroPatent France - Chadwyck-Healey France, 3, rue de Marivaux, 75002 Paris. Telephone: 33-42-86-80-20; FAX: 33-42-61-33-87.

MicroPatent Mexico - Diffusion Cientifica Latinoamericana S.A., Glorieta de Claveria, Mexico, 08020 DF. Telephone: 52-5-396-1818; FAX: 52-5-341-3647.

MicroPatent USA, 25 Science Park, New Haven, CT 06511. Telephone: 1-203-786-5500; FAX: 1-203-786-5499.

BIBLIOGRAPHY

1. Aina, "The Use of Patent Literature by Nigerian Scientists," Inspel 23(3) 164 (1989).

2. Antons, "Intellectual Property Law in Asian Countries: A Survey," 3 EIPR 78 (1991).

3. Antton and Feitshans, "Is the United States Automating a Patent Registration System for Software? A Critical Review of Information Management in the U.S.P.T.O.," J. Pat. Off. Soc'y, p. 894 (September 1990).

4. Baillie, "The Law, and Management of New Ideas," 3 Int. J. Technology Management 273 (1988).

5. Buntrock, "Patents - Markush And All That Stuff," Database, p. 94 (February 1991).

6. Chester, "Getting Benefits from Patents," 15(2) Lasie, 2 (September-October 1984).

7. Creel and Wintringham, "Patent Systems and Their Role in the Technological Advance of Developing Nations," 10 Rutgers Computer & Tech. Law Journal 255 (1984).

8. Cutler, "Acquiring Technology From Outside," Technology Management, p. 11 (May/June 1991).

9. de Araujo, "Patents as Information Sources," 10(2) Ciencia da Informacao 27 (1981) (article is in Portuguese).

10. Dueltgen, "Access to Japanese Technical Information," Database, p. 105 (April 1991).

11. Glasgow, "The U.S. Patent and Trademark Office: Progress Toward Automation," 32 Fed. B. News & J. 266 (June 1985).

12. Hart, "Patents: A Source for Research Ideas," 14(10) American Laboratory 162 (October 1982).

13. Heckert, "Use of Patent Literature as an Information Source in the GER--Its Present and Future Shape," 36(6) Informatik 213 (1989) (article is in German).

14. Helgerson, "The U.S. Patent and Trademark Office: Preparing for the 21st Century," J. Pat. Off. Soc'y, p. 577 (June 1990).

15. Hudnut, "Patents as Information Sources," Online '82 Conference Proceedings, p. 1.

16. Japan Economic Institute, "Intellectual Property: Whose Idea Is It, Anyway?" 8A JEI Report 1 (February 1989).

17. Keller and Chinta, "International Technology Transfer: Strategies for Success," 2 Acad. of Mgmt. Executive 33 (1990).

18. Kennedy, "Competitiveness and Technology Policy," 4 Int. J. Technology Management 265 (1989).

19. International Bureau of WIPO, "General Introduction to the Use of Patent Documents and Their Technological Information Control Therein," Document WIPO/PD/SOF/90/1 (October 1990).

20. International Bureau of WIPO, "Guidelines for the Planning and Organization of a Patent Document Center in a Developing Country," Document PCPI/GEN/1 Rev. 2 (January 15, 1986).

21. International Bureau of WIPO, "The International Patent Classification (IPC), Its Philosophy and Use," Document WIPO/PD/SOF/90/2 (October 1990).

22. Kostecki, "Sharing Intellectual Property Between the Rich and the Poor," 8 EIPR 271 (1991).

23. Kumar, "Patents as Source of Technical Information," 23 Herald of Libr. Sci. 175 (July-October 1984).

24. Lambert, "After the Grant: Online Searching of Legal Status Information for U.S. Patents," Database, p. 42 (August 1991).

25. Lasserre, "Training: Key to Technological Transfer," 15 Long Range Planning 51 (June 1982).

26. Lawson, "Patents as a Source of Technological Information," paper accompanying presentation delivered in Chicago, Ill., December 1, 1979.

27. Lawson, "USPTO Perspective - Use Automation Products Available From USPTO," for presentation at AIPLA, mid-winter meeting, January 1992.

28. Lomio, "Intellectual Property Law and the Protection of Computer Programs," Database, p. 31 (June 1990).

29. Mackley, "The Role of the Patent System in Technology Transfer: Japanese Experience," 26 Columbia Journal of Transnational Law 131 (1987).

30. Major, "Some Practical Intellectual Property Aspects of Technology Transfer," 3 Int. J. Technology Management 43 (1987).

31. Mandeville, "Australian Use of Patent Information," 5 World Patent Information 79 (1983).

32. Montero-Rios, "The Spanish Experience in the Field of Technology Information," 10 World Patent Information 108 (1988).

33. Pilny, "A First Step Towards a Paperless Patent System in Japan," 5 EIPR 183 (1991).

34. Pritchard and Hutchens, "Remote Access to Corporate Public Records: Scanning the Field," Database, p. 24 (April 1991).

35. Simmons and Kaback, "Online Patent Information," 10 World Patent Information 204 (1988).

36. Tertell, "Patents Are an Overlooked Information Source," Bull. Am. Soc'y Info. Sci., p. 24 (October/November 1986).

37. Triana, "Technology Parks and Technology Transfer," 4 Int. J. Technology Management 431 (1989).

38. Uhrich, "The Utilization of Secondary Information Sources for Patent Information," 28 Informatik 17 (1981) (article is in German).

39. "Views From Across the Pacific: JPOS (Japanese Patent Office Society) Talks," J. Pat. Off. Soc'y, p. 1025 (November 1990).

40. Wigand and Frankwick, "Inter-organizational Communication and Technology Transfer: Industry-Government-University Linkages," 4 Int. J. Technology Management 63 (1989).

41. WIPO Background Reading Material on Intellectual Property, WIPO Publication No. 659(E) (1988), particularly Chapter 5 entitled "Patent Information and Documentation," pp. 119-142.

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