



SYMPOSIUM ON CREATIVITY AND THE PROMOTION OF INVENTIVE ACTIVITIES

Beijing, October 10 to 14, 1988

jointly organized by

the World Intellectual Property Organization (WIPO) and
the International Federation of Inventors' Associations (IFIA)

in cooperation with

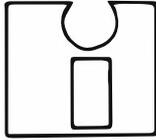
the State Science and Technology Commission of China (SSTC)

and the China Association of Inventions (CAI)

and with the assistance of

the United Nations Development Programme (UNDP)





**INTERNATIONAL FEDERATION OF
INVENTORS' ASSOCIATIONS
(IFIA)**



**WORLD INTELLECTUAL PROPERTY
ORGANIZATION
(WIPO)**

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**GENEVA
1989**

The four stamps on the cover page were issued in 1953 and represent scientific instruments developed in ancient China, namely :

- a compass, made during the era of the Warring States (3rd century B.C.) ;
- a seismoscope (132 A.D., the East Han Dynasty) ;
- a device for measuring distances (the Jin Dynasty, 3rd century A.D.) ;
- an armillary sphere (astronomical device) (Ming Dynasty, 1437 A.D.) .

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FOREWORD

The present volume contains the texts of the papers and other relevant information presented at the Symposium on "Creativity and the Promotion of Inventive Activities" which took place in Beijing, China, in October 1988, and serves as a permanent record of the stimulating exchange of views which took place in that Symposium.

The Symposium was organized jointly by the World Intellectual Property Organization (WIPO) and the International Federation of Inventors' Associations (IFIA), in cooperation with the State Science and Technology Commission of China (SSTC) and the China Association of Inventions (CAI), and with the assistance of the United Nations Development Programme (UNDP). It was held in conjunction with the General Assembly of IFIA and the Beijing International Exhibition of Inventions, at which three WIPO Gold Medals were presented to three Chinese inventors for "Outstanding Invention," "Outstanding Woman Inventor" and "Outstanding Young Inventor."

Over 125 participants from 32 countries attended the Symposium which examined five topics, namely, evaluation of human qualities necessary for invention, how to encourage young people to be creative, how to encourage inventors in enterprises and R&D centers, how government institutions and inventors associations can make better known the intellectual property system to inventors and potential inventors and how to create a favorable environment for inventiveness, particularly in rural areas.

I should like to take this opportunity to renew WIPO's thanks to the China Association of Inventions, and in particular to its President, Mr. Wu Heng, for the excellent organization of the Symposium and to the speakers who presented papers.



Arpad Bogsch
Director General
World Intellectual Property Organization

Geneva, March 1989

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Opening address

by

Dr. Arpad Bogsch, Director General,
World Intellectual Property Organization (WIPO)

Excellencies,
Ladies and Gentlemen,

It gives me great pleasure to be present here today, in Beijing, for the opening of the Symposium on Creativity and the Promotion of Inventive Activities, which has been organized jointly by the World Intellectual Property Organization (WIPO) and the International Federation of Inventors' Associations (IFIA), in cooperation with the State Science and Technology Commission of China (SSTC) and the China Association of Inventions (CAI), and with the assistance of the United Nations Development Programme (UNDP).

Allow me, at the outset, to express the greetings and the deep appreciation of the World Intellectual Property Organization to our Chinese hosts. First, I greet Mr. Wu Heng, a long standing friend of WIPO, the principal architect and one who can truly be said to be the founding father of the Chinese Patent System who, since the past three years, has placed his vast knowledge and experience at the service of inventors as the first Director General of the Chinese Patent Office and now as President of the China Association of Inventions.

I also express my greetings to Mr. Gao Lulin, the representative of the Director General of the Chinese Patent Office, and through him to Mr. Jiang Minkuan, Vice-Minister of the State Science and Technology Commission of China (SSTC), the Director General of the Chinese Patent Office.

Our greetings and appreciation also go to Mr. Guo Shuyan, who combines the important function of Deputy Chairman of the State Science and Technology Commission of China (SSTC) under which the Chinese Patent Office is placed, with the function of Vice-President of the China Association of Inventions.

I should like also to express our thanks to the members of the Secretariat of the China Association of Inventions, who all have worked hard and long to make this Symposium such a success and our stay in Beijing a memorable event.

Now, I would like to pay tribute to the International Federation of Inventors' Associations (IFIA), to its President, Mr. Clarence Feldmann, and to his associates who have also worked much and well for the success of this Symposium. It is a pleasant coincidence that we have among us today the two former presidents of the International Federation of Inventors' Associations, Mr. Wallin and Dr. Ware, who both also put their talent to the success of our past two joint WIPO-IFIA conferences in Stockholm, in 1986, and in Geneva, in 1984.

Our thanks, through Mr. Morey, Resident Coordinator, also go to the United Nations Development Programme (UNDP) for its strong support and assistance to WIPO's development cooperation program and, in particular, its program for the promotion of invention and innovation in developing countries. It is to the financial assistance of the UNDP that we owe the presence among us today of some 14 representatives of developing countries from Asia.

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Ladies and Gentlemen,

A few months ago, last June, WIPO organized in Abidjan (Côte d'Ivoire) the first African Regional Conference on the Promotion of Innovation at which representatives of inventors' associations, governmental authorities and research and development institutions from 23 African countries discussed how to make a better use of the existing inventive capacity in each country and at the regional level. On that occasion, the African Federation of Inventors' Associations (AFIA) was formally established.

The present Symposium is the first meeting of the kind organized in Asia. It is also the third worldwide joint manifestation organized by WIPO and IFIA in the framework of our cooperation for the benefit of inventors. These joint WIPO-IFIA meetings represent an excellent opportunity to discuss specific aspects and problems related to invention and inventive activity, to exchange opinions and experience and to draw the attention of both WIPO and IFIA to certain questions which, from the point of view of inventors, should be studied or dealt with within the framework of the international cooperation in the field of industrial property.

I therefore welcome not only the inventors and the representatives of these associations--some 20 associations--but also the presence in this room of representatives of governments and official institutions from several countries. Their presence proves once again the interest that governmental authorities show for inventive activity and for inventors.

I warmly welcome all the participants in the Symposium, many of whom have come from very far-distant countries. They represent inventors' associations, governmental authorities and

business circles in 32 countries, namely: Bangladesh, Bulgaria, China, the Democratic People's Republic of Korea, Egypt, Finland, Germany (Federal Republic of), Greece, Hungary, India, Japan, Lybia, Malaysia, Nepal, New Zealand, Nigeria, Norway, Pakistan, the Philippines, Poland, Portugal, the Republic of Korea, Singapore, the Soviet Union, Sri Lanka, Sweden, Switzerland, Thailand, the United Kingdom, the United States of America, Viet Nam and Yugoslavia.

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All the five topics that will be discussed at this Symposium are of great importance. They will be presented by keynote speakers, each of whom is an expert in his respective field and I wish to thank them for their important contribution. They are, in the alphabetical order of their names:

Mr. GAO Lulin, First Deputy Director General, China Patent Office

Mr. GUO Shuyan, Vice Chairman, State Science and Technology Commission, Vice President, China Association of Inventions

Dr. Erich HAUSSER, President, German Patent Office

Mr. MA Chenglin, Vice President, Jilin Polytechnic University

Mr. Stuart MACDONALD, Visiting Research Fellow, Department of Social Sciences and Humanities, the City University, London; Reader in Economics, University of Queensland, Brisbane (Australia)

Opening address by Dr. Arpad Bogsch

Dr. Ronald VERSIC, Chairman, Youth Inventors' Committee,
Inventors Council of Dayton (Ohio)

Mrs. Magdalena VILLARUZ, President, Women Inventors
Association of the Philippines; President, SV
Agro-Industries Enterprises, Inc.

Mr. Masakazu YOKOYAMA, Manager, Training Center for
Industrial Property, Japan Institute of Invention and
Innovation (JIII)

Mr. YUAN Zhangdu, Vice President, Shanghai Society of
Synetics

Mrs. ZHANG Lian, Director, Department of Communication,
China Association of Inventions

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Ladies and Gentlemen,

On the occasion of this Symposium, we will have the unique opportunity to visit the first International Exhibition of Inventions organized in China by its young, but dynamic Association of Inventions. And the day after, I shall have the pleasure to hand over three WIPO Gold Medals to the winner of the Outstanding Invention at the said exhibition, to the Outstanding Woman Inventor and an Outstanding Young Inventor. Speaking of WIPO medals, I have noted with great pleasure and I am proud that, in this room and at this Symposium, eight persons have already received this international award. Allow me to name them here:

Mr. WU Heng, who needs no further presentation;

Two founders of IFIA: Mr. Harald ROMANUS, from Sweden, and Dr. Friedrich BURMESTER, from the Federal Republic of Germany;

Five Filipino inventors : Mrs. Magdalena VILLARUZ, one of our speakers, who was designated Inventor of the Year in 1986 in her country; Mrs. Olympia GONZALES, elected Best Woman Inventor in her country, in 1985; and Messrs. Bonifacio ISIDRO (two Gold Medals); James REAMON, Jr., and George DY, Jr.

I would ask you to applaud them as a token of your recognition.

I also would like, once again, to wish this Symposium every success and to thank our Chinese hosts.

Opening address

by

Mr. Clarence P. Feldmann, President

International Federation of Inventors' Associations (IFIA)

Honourable Director General of WIPO, Dr. Bogsch,
Honourable President of the China Association of Inventions,
Mr. Wu Heng,
Most honourable official Guests,
Dear Keynote Speakers,
Dear Participants,

On behalf of the International Federation of Inventors' Associations representing 25 national Inventors Associations from four continents, I am very proud to welcome you to the first WIPO-IFIA Symposium.

Although this is the first WIPO-IFIA Symposium, it is actually the third event of its kind. The first two meetings were called WIPO-IFIA Conferences. Like them, this symposium will form another sparkling diamond in a chain that may some day form a necklace made out of brilliant precious stones. As you know, diamonds have to be cut and polished to show their beauty.

Why did I choose the comparison with diamonds?

As you know, the value of a diamond depends on two important factors, the weight in carat and the quality of the cutting. Let us assume there is one carat for each participating country and already we get a precious stone that represents a fortune.

Now starts the diamond cutter's work to make the facettes, the small sparkling planes. The world's best diamond cutters to be found are the keynote speakers present here today. Their different views, opinions as well as their knowledge in the broad field of inventions form the large number of facettes that increase the value of our diamond.

What is left for us to do?

We still have to polish each facette of our precious stone. All participants are kindly invited to do so with their experience and know-how, so that our children and grand-children will remember the famous "Beijing-Diamond".

In the name of all my colleagues of the Executive Committee and all members of IFIA, I would like to present my thanks to the Director General of WIPO, Dr. Arpad Bogsch, and his staff, to the President of the China Association of Inventions, Mr. Wu Heng, and his colleagues, and finally to all my friends in IFIA for the enormous efforts put in the preparation of this Symposium.

It may not be polite to single out some persons in particular, but without the never-ending support in the preparatory work from Mr. Farag Moussa, Head of the WIPO Section for Relations with International Organizations and Promotion of Innovation in Developing Countries, and my colleague Mr. Sten V. Joste, Secretary General of IFIA, the tool room for the diamond cutting would never have been ready in time.

Honourable Guests, dear Participants, I am ready to cut and to polish,

I wish you all a successful work.

Thank you for your attention.

Opening address
by
Mr. Li Xu E, Vice Chairman,
State Science and Technology Commission

Respected Dr. Arpad Bogsch,
Respected Mr. Clarence Feldmann,
Ladies and Gentlemen:

The Symposium on Creativity and the Promotion of Inventive Activities hosted by the World Intellectual Property Organization (WIPO) opens today, while the 1988 Annual General Assembly of the International Federation of Inventors' Association opens here simultaneously. It is very significant for the over 190 experts who have theoretically and practically made remarkable achievements in science and technology and for the organizers who have devoted themselves to the inventive activities, from various countries and regions of the world, to gather here and jointly discuss the creativity and the promotion of inventive activities, which will certainly produce the positive effects on promotion for the development of creativity and inventive activities. Would you please allow me, here, to warmly welcome our friends from the five continents of the world on behalf of the State Science and Technology Commission, and to extend my warm congratulations to the two international meetings!

There are creative activities in each field of human society, and every human being in the society possesses, more or less, creative power. It has become a new discipline of science and technology--synectics--to discover such a creative power of the human being, to understand it, to make research on it and to develop it. The application on the newly-emerged

subject has greatly accelerated the development of creative power and the production of new knowledge; therefore, the progress of science and technology and the growth of social economy have been speeded up. Our government always pays attention to the inventive activities from the broad masses of people. The policies and laws for encouraging innovations, rewarding inventions, funding developments and protecting patents have been formulated and promulgated so as to provide the essential conditions for setting up the desirable environment in the development of the creative power and, therefore, the creative and inventive initiatives from the broad masses of people have been mobilized. In recent years, several thousands of inventive results have been yearly created, from which several tens of billion yuan of economical benefits have been made for the society. Simultaneously, the rationalization proposals and the activities of technical innovations from the enterprise staff have been broadly developed. According to statistics, the staff members can put forward more than 10 million pieces of the technical innovations and rationalization proposals every year in the country, among them, approximately 10 million may be accepted and implemented. The staff members in the whole country also bring themselves into full play in the areas of tackling the key technologies and popularizing the technical innovations. The rapid growth of techmarts in the country, is a vivid evidence of the vigorous development of the creative activities from the broad masses of people in the economical activities. There were almost no techmarts in the country several years ago. In recent years, the total output of domestic trade in techmarts has reached several billion yuan. Meanwhile, the country began to export technologies and it marked the end of the era that China only imported technologies from abroad and could not export technologies to the foreign countries. Even though China started to make research in synectics not long ago, the glaring achievements, in the past few years, have been

made in the fields of education, industry, literature and art in respect of the research, popularization and application of synectics. Academically, the problems such as the law for creation, the creative thinking, the creative techniques, the environment for creativity, the training for the creative personnel, etc., have also been widely discussed; practically all the various factories educate their staff members by use of synectics. So, the creative power of their staff is universally improved and the vigorous development of inventions and innovation activities, in the factories, are greatly promoted. The research organizations of the synectics have been set up and the related training courses have been held in some universities and research institutions of the country. The synectics is taking roots in the beautiful landscape of China. The study on the synectics and the creative and inventive activities will be more vigorously developed in China.

Certainly, there are still some gaps in the field of study on synectics and in the development of creative power in our country compared with some other countries. The two important meetings which are to take place here this week are good opportunities for us to learn from the participating countries and all the experts who are present at the meetings. We will do our best to intensively develop the inventive activities and exploit the creativity from the broad masses of people, with an aim to create many more inventions for the country and for the whole world.

I wish the meetings a great success!

Thank you all.

Opening address
by
Mr. Wu Heng, President,
China Association of Inventions

Respected Dr. Arpad Bogisch, Director General of the World Intellectual Property Organization;
Respected Mr. Clarence Feldmann, President of the International Federation of Inventors' Associations;
Respected friends, participants, ladies and gentlemen:

The whole staff of the China Association of Inventions and I, myself, are very pleased that the Symposium on Creativity and the Promotion of Inventive Activities, prepared jointly by the World Intellectual Property Organization and the International Federation of Inventors' Associations opens now. Here, we would like to extend our warm congratulations to the opening of the Symposium.

Fellow participants, you make light of travelling a thousand li to come to Beijing for the purpose of exchanging experience in researching and developing creativity. This will provide a very good opportunity for the Chinese inventors to learn from you. So, here, we will express our heartfelt thanks to you all.

Creativity is possessed only by the human being. Today's high level of our material and cultural life cannot be reached without the development of creativity. Since the 20th century, people have performed many miracles and they have reason to expect the coming of a more advanced 21st century. By that time, new and higher-level inventions will be much more brilliant, and they will make the future of mankind more prosperous.

Inventions and transformed technologies are the crystallization of the people's creative activities. And inventions and discoveries in science and technology are playing a greater role in people's production and in their economic life. Therefore, it is very important to organize discussions on how to develop creativity and promote inventive activities.

The Chinese government has been paying attention to the activities of invention and the transformation of technology. Soon after the founding of New China, our government promulgated the regulations on rewarding inventions and rationalization proposals and on protecting patents. In 1963 and 1979, the Regulations on Rewards for Inventions was issued twice and, in 1985, the Patent Law was made public in an order of the President of the People's Republic of China. Through these efforts, laws on rewarding and protecting inventions have been gradually worked out and perfected, which has further stimulated the people's enthusiasm for invention and creation. It is under such circumstances that, in 1985, the China Association of Inventions emerged. Every year, the Association holds a national exhibition of inventions, in which about 1,000 new inventions are on display. One-third of these inventions have been or will soon be converted into production, which will give great impetus to the development of China's economy. Among Chinese inventors, there are not only scientists and technicians at their posts, but also non-professional inventors, there are not only adults, but also youngsters. It can be said that China's invention work has come into the best period in history.

In order to find the laws and methods of invention and creation, many Chinese experts and scholars in colleges and universities have started researching science of creative thinking since 1980s. They have published their works, translated foreign books in this respect and widespread the

knowledge of creative thinking and the methods of creating in factories and other enterprises, as well as in colleges and universities with regard to having people scientifically conduct inventive and creative activities. Such research work has just been started, but some initial results have been achieved.

All the people attending the symposium today are experts who have been engaged in research of invention and creation for many years. We shall learn from every one of you and appropriately apply the advanced experience of yours to China's inventive activities.

Thank you all! I wish the Symposium a complete success.

CONCLUSIONS OF THE SYMPOSIUM

A symposium on "Creativity and the Promotion of Inventive Activities" was held at Beijing from October 10 to 14, 1988. It was organized jointly by the World Intellectual Property Organization (WIPO) and the International Federation of Inventors' Associations (IFIA), in cooperation with the State Science and Technology Commission of China (SSTC) and the China Association of Inventions (CAI) and with the assistance of the United Nations Development Program (UNDP). There were 125 participants from the following 32 countries: Bangladesh, Bulgaria, China, Democratic People's Republic of Korea, Egypt, Finland, Germany (Federal Republic of), Greece, Hungary, India, Japan, Lybia, Malaysia, Nepal, New Zealand, Nigeria, Norway, Pakistan, Philippines, Poland, Portugal, Republic of Korea, Singapore, Soviet Union, Sri Lanka, Sweden, Switzerland, Thailand, United Kingdom, United States of America, Viet Nam, Yugoslavia.

The participants were Government officials working in institutions and departments responsible for the protection of inventions and promotion of inventiveness, officials of national associations of inventors, representatives of other interested circles, such as professors, lawyers, industrialists, etc.

This Symposium was a follow-up of two conferences also organized jointly by WIPO and IFIA in May 1984, at the headquarters of WIPO in Geneva, and in June 1986, in Stockholm. The theme of the first conference was the situation of inventors while that of the second conference was inventions for development. The theme of this Symposium, in Beijing, was "Creativity and the Promotion of Inventive Activities."

The Symposium was opened by Dr. Arpad Bogsch, Director General of the World Intellectual Property Organization (WIPO), and Mr. Clarence Feldmann, President of the International Federation of Inventors' Associations (IFIA), with opening addresses also by Mr. Li Xué, Vice-Chairman of the State Science and Technology Commission of China (SSTC), Mr. Wu Heng, President of the China Association of Inventions (CAI), and Mr. Roy Morey, Resident Representative of the United Nations Development Program (UNDP).

The Symposium elected five co-chairmen. They were, in the alphabetical order of their names:

Dr. Friedrich Burmester (Germany, Federal Republic of)
Dr. Naeem Ahmad Khan (Pakistan)
Mr. Tivadar Palagyi (Hungary)
Mr. George S. Welsch (United States of America)
Mr. Wu Heng (China)

Each presided over the discussions of one of the five topics of the Symposium.

Mr. Clarence Feldmann (IFIA) and Mr. Farag Moussa (WIPO) jointly acted as Secretary General of the Symposium.

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During the period of the Symposium, the participants had the opportunity to visit the Beijing International Exhibition of Inventions and, on October 13, 1988, to attend--at the Great Hall of the People--the closing ceremony of the exhibition. At this ceremony, several awards were given. The Director General of WIPO presented three WIPO Gold Medals to each of the winners of the "Outstanding Invention," the "Outstanding Woman Inventor" and the "Outstanding Young Inventor."

Conclusions of the Symposium

In this connection, the Symposium welcomed the fact that WIPO awarded gold medals to inventors and promoters of inventive activity and warmly applauded eight of the participants in the Symposium who had already obtained that prestigious international award.

Also during the period of the Symposium, the International Federation of Inventors' Associations (IFIA) held its General Assembly, and associations of inventors from nine countries were admitted as full members or candidate members or corresponding members*. The countries from which the different member associations in IFIA come from has therefore reached the number of 31.

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The Symposium examined five topics, namely:

- (i) evaluation of the human qualities necessary for inventions;
- (ii) how to encourage young people to be creative;
- (iii) how to encourage inventors in enterprises and R&D centers;

* Full members: Egypt, Japan, Paraguay, Singapore, United States of America.

Candidate members: Bangladesh, Malaysia, Nigeria.

Corresponding member: Women Inventors Association of the Philippines.

- (iv) how government institutions and inventors associations can make better known the intellectual property system to inventors and potential inventors;
- (v) how to create a favorable environment for inventiveness, particularly in rural areas.

The discussions took place on the basis of ten papers presented by five invited keynote speakers from Germany (Federal Republic of), Japan, Philippines, United Kingdom, United States of America, and five keynote speakers from China. The discussions were first introduced by comments from panel members from Bulgaria, China, Finland, Malaysia, Philippines, Republic of Korea, Soviet Union, Sweden, Switzerland, United States of America.

The discussions on the subject of "Evaluation of Human Qualities Necessary for Inventions," which was approached for the first time in a WIPO or IFIA meeting, revealed its complexity and the plurality of experiences and opinions on the matter.

It was found that the following human qualities could have a positive influence on the inventive activity of an individual: creative ability, perseverance, imagination, knowledge, memory, originality, analytic ability, self-confidence, keen observation, common sense, business ability, enthusiasm, inclination to adventure or risk-taking, mistrust for established scientific and other truths.

The participants agreed that the results of a deeper study of the subject under consideration could be of assistance when examining other aspects of inventive activity: the education of inventors, the necessary inventive environment for inventors whether they be individuals or employees in enterprises and organizations.

Conclusions of the Symposium

Bearing in mind that human qualities are difficult to modify or change, the participants noted that in many countries and individual companies, various inventive techniques had been implemented with the objective of revealing latent qualities and stimulating imagination and innovative talents.

Application of creative techniques such as, inter alia, brain storming, permutation technique, comparison technique, quality control circles, suggestion schemes, etc., matched with a remuneration and an awards system had proven in many cases to be an excellent way to motivate people to make full use of their creative talents and to find inventive solutions to existing problems.

More thorough studies on the subject were therefore necessary. Other studies could explore the ways and means of developing some specific human qualities necessary for inventive activity in young people.

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On the topic of "How to Encourage Young People to be Creative," the participants noted with interest the efforts already undertaken in various countries to awaken, encourage, stimulate, and develop creativeness and an inventive spirit existing among youth. They noted that it was necessary to develop different programs for each age group (for instance from 5 to 11-12, 13 to 20, and 20 to 30), and to make special efforts in favor of girls. The participants also stressed the important role which laid upon both parents and teachers, as well as that of the press and government authorities.

Finally, the participants welcomed the initiative taken by WIPO and IFIA in submitting this topic to the Symposium, and considered it of capital importance. It was generally felt that the subject of youth and inventive creativity should be studied in greater depth and that a wider exchange of information and experience should be established, including through the convening of a special meeting on the subject at the international level. Such a meeting should include, inter alia, those directly concerned, namely young creators themselves, and should consider the various aspects of the problem, including the question of education and the teaching of industrial property.

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On the question of "How to Encourage Inventors in Enterprises and R&D Centers," the participants noted that employees' invention schemes introduced originally by enterprises merely to reward and remunerate inventive employees, were used increasingly today by innovative enterprises to promote and encourage inventive and innovative behavior and thinking of employees which was indispensable for maintaining the competitive position of the enterprise.

It was further noted that, in some countries, national invention and innovation promotion systems were established with the aim of guaranteeing a minimum of rewards and honors to inventors. The laws of some countries provided that a special remuneration would be due for all service inventions since an invention protected by a patent conferred upon an employer an exclusive right and consequently a preferential position with regard to the exploitation of the invention.

Conclusions of the Symposium

Furthermore since, normally, employees and researchers were not employed to invent and the regular salary was rarely determined on the basis of the inventive activity actually deployed, and since inventions constituted particularly meritorious achievements, such inventive activity should lead to special rewards to the inventor.

It was one of the most important task of inventors' associations to actively promote the introduction of sound and just provisions concerning employees' inventions in national industrial property laws or in related laws and of employees' inventions promotion schemes in enterprises and R&D institutions, with the goal to better protect the interests of inventors.

Such employees' inventions promotion schemes could provide for inventors monetary rewards independently of, or in addition to, statutory remuneration for inventions and innovations, or to receive medals, publicity or some form of a promotion. Statutory and contractual remuneration for employee inventions, as well as additional rewards, should be granted in an equitable, non-discriminatory manner and on a regular basis.

The need for model provisions taking care of the correct and justified remuneration and reward of the inventors came up. It was suggested that IFIA and WIPO study this question and organize an exchange of practical experience of all parties concerned.

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When considering the topic of "How Government Institutions and Inventor Associations can make better known the Intellectual Property System to Inventors and Potential Inventors", it was stressed that the importance of the patent

system to economical development and technical progress was fundamental. The grant of exclusive rights limited in time fostered competition between inventors which, in turn, was at the origin of new technologies. This was the prime role of industrial property rights.

It was well known and it was not questioned that the naming of the inventor was a non-pecuniary personal right and that it formed, through the publication of the name, part of the recognition and reward of the inventor.

The speakers and the participants agreed that a rapid and reliable granting procedure was an effective support to the applicant. But patent offices should provide further assistance to improve the encouragement of inventors. A traditional means was the patent documentation that represented a valuable source of information. New possibilities were licensing data banks offered by the Patent Office. In some cases, the assistance of the Patent office had been extended to inventors in exploiting the patented technology.

It was also mentioned that in several countries where inventors associations already existed, the cooperation with the patent office had increased with mutual benefit for both parties.

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With respect to the subject of "How to Create a Favorable Environment for Inventiveness, Particularly in Rural Areas," it was noted that in spite of the considerable experience in creating favorable conditions for the development of inventive activity in the industrial sector, the rural sector was very rarely the target of such efforts.

Conclusions of the Symposium

The participants noted further that the particular circumstances of agricultural production in developing countries and its organization (small, family businesses, high degree of manual operations, etc.) opened large possibilities for "small" technological innovations and improvements which, although in most cases they were not recognized as inventions under the industrial property laws, constituted, however, considerable progress as they made life and work easier and more productive.

The participants considered that a simple system for dissemination of information on "small" technological innovations and improvements among rural communities would have a significant stimulating effect on the use and adaptation of new experiences and would stimulate the rural workers to search for new, innovative solutions to existing problems. The importance of South-South exchange of information was stressed. The problem needed additional studies, in particular with respect to the readiness of the rural population to share experience and to introduce substantive changes in their routine labor.

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The Symposium expressed its gratitude to all the lecturers for their excellent contributions that had enabled a broad exchange of information and experience to be achieved among the participants.

The participants expressed their satisfaction to WIPO and IFIA for the excellent preparation and organization of the meeting, which ensured the successful progress of the debates. The Symposium likewise stressed the importance and the quality of WIPO's activities in the field of the promotion of innovation, particularly in Asia and the Pacific.

The Symposium reiterated its heartfelt thanks to the United Nations Development Programme (UNDP) for its generous contribution that had made it possible to bring together 12 participants from 10 developing countries of Asia and the Pacific.

The participants also expressed their deep gratitude to the State Science and Technology Commission of China and the China Association of Inventions for having hosted the first international symposium of this kind. Special thanks were addressed to Mr. Wu Heng, President of the China Association of Inventions, and to the Chinese secretariat of the Symposium for the excellent organization, the kind assistance and hospitality offered to the participants during their stay in Beijing, including the opportunity to visit the Beijing International Exhibition of Inventions, and to attend its unique and prestigious award ceremony at the Great Hall of the People.

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EVALUATION OF THE HUMAN QUALITIES
NECESSARY FOR INVENTIONS

INDEPENDENT INVENTORS AND THE STIMULUS OF ADVERSITY

by

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INTRODUCTION

Creativity is the single human quality most essential for invention, an assertion which, like any other truism, meets with resounding agreement and reveals almost nothing. Creativity is just as obviously required of musicians, artists and sculptors--even of those who write conference papers--and these are not inventors in any strict sense. Moreover, an individual endowed with lashings of creativity but deficient in other human qualities would not make much of an inventor. To be just slightly cynical, he would be poorly equipped to deal with the patent system, which is much more demanding of faith, tolerance and patience. This is not unimportant, for the patent system provides the usual means in the West of identifying the existence of invention, and thereby of inventors. Consequently, there is a real danger that, by concentrating on inventors and inventions within the purview of the patent system, the human qualities revealed are not so much those required for invention, as those required for the patent system.

This paper cannot avoid that danger, though the conclusions suggest that the reliance is not critical, perhaps even that it may be appropriate.¹ They are that there is little justification for thinking that the basic human qualities of inventors are very different from the human

qualities of anyone else. What makes an inventor different seems likely to be the obstacles he meets during the course of invention, especially in attempting to develop the invention --and including encounters with the patent system. It is challenge and adversity that hone human qualities into those of an inventor, and efforts to make life easier for individuals who invent may well threaten the very qualities which impel them. Primary interest here is with independent inventors, basically those who are not paid to invent by an employer. That is not to say that others who invent do not have human qualities, or that there is evidence that these are markedly different from the qualities of independent inventors. It is merely that human qualities are the more evident unencumbered by the exigencies of organization, and it is upon independent inventors that this paper will focus its attention.

PATENTS AND INVENTION

Not all inventions are patented and by no means does a patent represent a standard unit of invention. Patents are merely an indicator of invention, a highly inadequate one, but the best there is. They also have the advantage of being an output indicator in a field where these are so rare that input indicators commonly have to be used on the precarious assumption that resources put into an activity will be proportional to what comes out. In invention, or any other creative activity, such an assumption is rarely justified, and it may be that an important characteristic of independent inventors is their reluctance, or perhaps sheer inability, to consider effort in terms of productivity.

These days, more patents are granted to organisations, typically to firms, than to independent inventors.² The explanations are straightforward: the complexity of modern products and processes, the need for scientific foundation to investigative effort, for teams of professionals, for interdisciplinary endeavour, for immense capital resources; these are all considered essential to invention, and their importance is reflected in the distribution of patents.³ Were it feasible to distinguish between major and minor inventions, something which the patent indicator does not allow, organisational patents would become very much more dominant, or so it is claimed by those who believe that there is something inherent in an invention which predetermines the value of an innovation.⁴ Such claimants are generally quick to classify all but a handful of individuals' inventions as trivial, scarcely worth the bother of considering. Somewhat circuitous support is lent by the basic input indicator of inventive activity--research and development (R&D) statistics. Once it is accepted that R&D is required to produce invention, because independent inventors make no recognised contribution to national R&D accounts, logically they can produce no invention.⁵ Or, if it must be conceded--because of the patent statistics--that individuals do invent, then their inventions must be of a totally different sort from those emanating from officially recognised R&D. Once again, the conclusion is rapidly reached that only rarely can the inventions of individuals be of much importance. Patent statistics tend to support this stance: in Australia, whence comes most of the empirical evidence on which this paper is based, 71% of provisional specifications come from independent inventors, 54% of complete specifications, and only 9% of patents which last their full term.⁶

It is not the intention of this paper to enter the debate on the economic significance of independent inventors.⁷ However, if it is accepted that inventions from this source are of no importance, it is difficult to justify prolonged consideration of the human qualities behind these worthless inventions. To adopt the opposite stance--the heroic view of popular writers on invention--is equally unappealing, though for quite different reasons. Independent inventors have long been, and continue to be, sources of invention associated with major innovation.⁸ This does not mean that their invention--or invention from any other source for that matter-- produces major innovation.⁹ It does not; any more than any other single part of a complex and protracted innovative process can be said to produce innovation. Contrary to popular belief, and to much government science policy and the underlying philosophy of the patent system, there is nothing particularly seminal about invention; it is but a part, and probably a fairly small part, of the much grander process by which change is wrought.¹⁰ Consequently, it is the more amazing that the heroic view of the inventor--and especially the independent inventor--survives.¹¹ The assumption must be that there is something in the image that is compulsively attractive--perhaps its essential simplicity, perhaps the desire to see human qualities reshape inhuman systems. Because the myth is compelling, it is perpetuated and embroidered, not least by independent inventors themselves.

INDIVIDUALS IN ORGANISATIONS

Of course, those who invent in organisations, act in concert though they may, are still individuals with human

qualities. It is hard to believe that these qualities are radically different from those of individuals who act independently, not that there is much evidence one way or the other.¹² However, in studies of what makes an organisation inventive and innovative, consideration of human qualities is not paramount.¹³ Rather, scholars and others concerned with innovation policy see the important determinants of organisational creativity to be related to such factors as size of firm, R&D intensity and type of industry.¹⁴ Thus, small firms in high technology are considered to be especially creative.¹⁵ Larger organisations attempt to stimulate creativity by emulating the small, by encouraging entrepreneurship and creating venture groups, for example.¹⁶ Perhaps the ultimate dehumanising of the innovative process is the notion that invention and innovation occur inexorably in clusters along technological trajectories, a version of technological determinism that is rendered no more attractive by its appeal to historical inevitability.¹⁷ The notion that the different human qualities of individuals within organisations may be related to organisational creativity is rarely considered, and when it is can assume an alarming simplicity. For instance, it is sometimes claimed that Japanese organisations may be highly innovative, but that the Japanese are so regimented that they lack the human qualities necessary for invention.¹⁸ Pity the firm which formulates its business strategy on that conviction.

There is, of course, the behaviouralist school, believing that whatever organisations do is determined, at least in part, by the goals and ambitions of the individuals within them. Thus an owner of a firm may be expected to steer his organisation in rather a different direction from that chosen by a mere

manager, because his own interests are different. But this philosophy, although more humanistic than much science policy, does not extend beyond attributing a single set of human qualities to all managers, and another set to all owners. It casts individuals as role players or, at most, presents what the organisation does as a compromise reached by individuals within it. Only very occasionally does the notion emerge that individual human qualities may be crucial in governing the performance of the firm, most obviously when an eccentric owner insists on taking the helm personally. Very rare indeed is any attempt to classify firms anthropomorphically by the characteristics of the particular individuals they contain.¹⁹ Instead, it is acknowledged that the organisation can be so enveloping that it either molds individuals to fit a particular corporate style--IBM culture, for example-- or simply discourages individuality in favour of a general grey corporate uniformity.

No one thinks of corporate man as being especially creative, and much effort in management sciences is directed towards the problem of stimulating creativity.²⁰ Significantly, this effort seems largely concerned not with attracting or encouraging the human qualities necessary for invention, but rather with overcoming organisational barriers to human interaction.²¹ It is simply assumed that inventive characteristics--whatever they might be--are innate and that only organisational constraints stop them flourishing for the good of the firm. Thus, product champions, gatekeepers, quality circles and such like are recommended to encourage individual ideas the organisation would otherwise stifle.²² Incentive schemes are introduced to encourage individual contributions, though the company suggestion box remains stark

evidence of just how inept the tapping of creativity can be. The patent system itself can be used by the organisation as an incentive to creativity, especially where the patent is granted in the employee's name and can be presented as a mark of merit, or where an inventive employee is entitled to a share in the profits from a patented invention. The award systems for inventors in the socialist countries, including the People's Republic of China, also seem to offer distinction as an incentive to creativity within the organisation.²³

There is, of course, one sort of individual which the organisation can harbour who is thought to need no reward beyond success itself. The entrepreneur is the individual who can make the organisation move, make it do his bidding. Sometimes there is confusion between the inventor and the entrepreneur, with some scholars imagining them to play much the same role.²⁴ Occasionally this may happen, but much more usual is it for the entrepreneur to be strong where the independent inventor is weak.²⁵ The independent inventor commonly lacks the interest and ability to organise development, production and marketing. At these the entrepreneur excels; they are tasks requiring an organisation, just as the entrepreneur requires an organisation to drive, and to express himself. The independent inventor does not. Moreover, the independent inventor responds to challenge: the entrepreneur, it seems, is angry and impulsive, desperate to impose his own personality and to succeed as a man of the world.²⁶ The entrepreneur is an uncommon and unpleasant sort, not found in large organisations, and rarely among the ranks of individual inventors.

The consensus opinion seems to be that organisations are inimical to individuality and that obstacles must be overcome if natural creativity is to flourish. The consensus may be wrong. Where organisations exist without obstacles and specifically to allow individuals to do what they want--the alternative commune culture in the West, for instance, or even a holiday camp--individuals are generally remarkably unimaginative. It may well be that they require a few obstacles to stimulate inventiveness, and that such external influence is at least as important as any innate qualities in individuals.²⁷ However, to gain any clear perception of what these human qualities might be, it is best to look for them in individuals outside the organisation, in independent inventors, whose qualities should be unshrouded by organisational behaviour and structure.

THE INDEPENDENT INVENTOR

Patents are the only practical indicator of which individuals in the community at large are inventors.²⁸ Patents are not, of course, intended to function as indicators (though patent authorities are now making their statistics more accessible because of the growing importance of this role) and their limitations must be taken very seriously indeed if unfounded conclusions are to be avoided.²⁹ It is superficially attractive to imagine that the independent inventor makes such elemental use of the patent system that the normal caveats need not apply. The machinations of business strategy are assumed to tarnish the essential purity of a system that still allows an independent inventor simply to make public his invention in exchange for the community's acceptance

that the property is his. In fact, the human qualities of independent inventors--who inevitably include small companies whose owners register patents in their own name--seem to cause their own distortion to the theoretical purity of the system. This was a major finding of a survey of independent inventors who applied for patent protection in Australia in 1978, upon which much of the remainder of this paper is based.³⁰

There have, of course, been other surveys of independent inventors which have sought to throw light on their human qualities. That by Rossman, now well over 50 years old, is probably the most famous.³¹ Table 1 attempts to show what Rossman concluded--that there was substantial agreement on the main human qualities of inventors. They had such qualities as perseverance, imagination and originality. No doubt this is just as true today, but understanding is perhaps little advanced by the revelation. To know that parents should love their children is not sufficient either to identify a good parent or to analyse the motivation and performance of parents. What Rossman has identified as the human qualities of inventors is really little improvement on the cliché that they are creative. A more rigorous approach is required if anything of moment is to be discovered. The Australian survey, with its 601 respondents, is one of the few in this area and does seem to throw rather more light on the human qualities of a group of people who invent without being paid by an employer to do so, without the support of an organisation, and who think it worthwhile applying for a patent.

TABLE 1

RANKING OF HUMAN QUALITIES OF INVENTORS

	as perceived by		
	Research directors in organisations	Patent attorneys	Independent inventors
Perseverance	2	5	1
Imagination	4	3	2
Knowledge and memory	-	-	3
Business ability	-	-	4
Originality	3	1	5
Commonsense	-	-	6
Analytic ability	1	2	7
Self-confidence	-	-	8
Keen observation	8	6	9
Mechanical ability	-	9	10
Training and education	5	-	-
Reasoning and intelligence	6	-	-
Competence	7	-	-
Lack of business ability	-	4	-
Suspicion	-	7	-
Optimism	-	8	-

Note: Rossman received responses from 78 research directors, 176 patent attorneys and 710 independent inventors.

Source: after Joseph Rossman, Industrial Creativity. The Psychology of the Inventor, University Books, New York, 1964, pp.35-41.

By far the most distinctive feature of the Australian respondents was that all but 21 are male. Women apparently do not invent. Inventors are also somewhat older than the general population, though typically aged between 35 and 60 rather than in retirement. They are more likely to be, or to have been, married and they are very much better educated than the general male population, with a strong bias towards science and engineering qualifications. About half are self employed, either full or part time, running their own tiny businesses, though it would be fanciful to imagine that these businesses have been built on past inventions. Inveterate independent inventors are fairly uncommon and 40% of the survey group had never even applied for a patent before. That is not to say that they do not want to make money from their invention; many certainly do, but there is other motivation that seems to be more important. In particular, they are driven by a desire to solve problems within their own experience, to satisfy their curiosity about whether something will work, to help their fellow man, and--quite simply--to have fun (Table 2). Independent inventors actually enjoy inventing. Perhaps this is just as well for precious little use is made of the vast majority of their inventions. Why this is so may reveal a little more about the human qualities of these inventors.³²

Something over 40% of this group's inventions were in the fields of agriculture, personal and domestic objects, and health and amusement. That compares with about 10% in these categories for patent applications from Australian firms. So, there is a tendency for independent inventors to invent in areas of less interest to firms and--inevitably--for their inventions to be less complex than those of firms. There is little chance of these inventions ever becoming innovations, much less of them making money. In a successor survey,

organisations which were conducting research in the areas of 70 inventions from independent inventors with patents were asked their opinion of the inventions' prospects.³³ It was usually not high (Table 3), at least not for the vast majority of even patented inventions--and most independent inventors who apply for patents do not succeed even there. The debate on whether it is worth searching for a few nugget inventions in a mountain of dross is not relevant here:³⁴ how independent inventors react to the general attitude to their inventions certainly is for it may well illuminate human qualities.

TABLE 2

WHY INDEPENDENT INVENTORS INVENT

	Responses	% of respondents
To solve specific problems	411	70
To make money	328	56
To be useful to society	260	44
To satisfy natural curiosity	178	30
For fun	118	20
Total responses	1295	
Total respondents	586	

Note: Inventors were asked to select all reasons applicable.

Source: Stuart Macdonald, 'Australia--the patent system and the individual inventor', European Intellectual Property Review, 6, 1983, pp. 154-159.

TABLE 3

ORGANISATION'S OPINION OF INVENTIONS
FROM INDEPENDENT INVENTORS

Technical ingenuity % of inventions		Potential commercial value % of inventions	
Fairly obvious	63	None	20
Clever	31	Small	65
Ingenious	4	Considerable	15
Brilliant	2	Worth a fortune	0
Total	100	Total	100
(Number of organisations giving opinion) (70)		(68)	

Source: Stuart Macdonald, 'The distinctive research of the individual inventor', Research Policy, 15, 1986, pp. 199-210.

Accept for the moment that application for a patent is an early and obvious step for an independent inventor seeking to be businesslike in the exploitation of his invention.³⁵ As Table 4 suggests, most apply in order to make money from the invention, but other reasons are also important, many of which have nothing to do with exploitation, and are unrecognised in patent theory. Not surprisingly, most independent inventors encounter obstacles in getting not just money, but anything else out of their invention. Basically, the world does not want to know, but note the wide range of factors that individuals perceive as responsible for this situation. Although many independent inventors acknowledge their poor marketing skills, very few admit to any deficiency

in their invention, and most are anxious to blame a myriad of factors beyond their control. Indeed, a good half of these independent inventors subsequently revealed that they would have been quite happy with some sort of adjudicated, non-marked reward for their invention, perhaps even just honour and glory.

TABLE 4

REASONS FOR WANTING A PATENT
(INDEPENDENT INVENTORS, AUSTRALIA, 1978)

	Responses	% of respondents
To make money out of the invention	436	77
To prevent others making money out of the invention	220	39
To justify inventive activity to self	155	27
To dermine whether the invention is any good	120	21
To inform the public of the invention	112	20
To assist application for development funding	64	11
To justify inventive activity to friends and relatives	61	11
Other reasons	8	-
Total responses	1176	
Total respondents	569	

Note: Inventors were asked to select whatever reasons applied.

Source: As for Table 2.

TABLE 5

OBSTACLES ENCOUNTERED BY INDEPENDENT INVENTORS
IN REALISING GAINS FROM INVENTIVE ACTIVITY

	Responses	% of respondents
Lack of funds to prove potential of invention	286	53
Cost of patenting	233	43
Poor marketing skills	194	36
Manufacturers not interested in inventions from independent inventors	186	35
Manufacturing too costly for existing market	126	23
Complexity of the patent system	126	23
Inadequacy of the invention	61	11
Problems associated with scaling up of invention	47	9
Lack of co-operation from the Patent Office	22	4
Lack of co-operation from patent attorneys	20	4
Failure to be granted a patent	16	3
Potential or actual costs of dispute over ownership	15	3
Total responses	1332	
Total respondents		539

Note: Independent inventors were requested to identify all applicable obstacles.

Source: As for Table 2.

From such observations it is possible to construct a rough model of how independent inventors see the innovative process beyond invention. There is a considerable literature on the risks, the expense, the trials and tribulations of development, production and marketing; compared with these, the problems of invention are almost inconsequential. Yet, perhaps half of this sample of independent inventors was blissfully unaware of any difficulty in the innovative process except that of invention. As Figure 1 illustrates, these inventors perceived money and social good springing automatically from invention, with or without the assistance of the patent system. The other half is well aware of the sheer hard grind that awaits those who are willing to face route B.

The transparent unworldliness of so many independent inventors deserves some explanation. Part of that lies in their sources of information; they rely almost entirely on their own links with industry, on books, and on technical and trade journals. They make little use of scientific or of academic sources of information. Even patent specifications are not important sources of information and many independent inventors invent what has already long been invented. In short, most independent inventors are unaware of anything other than their own immediate surroundings.

FIGURE 1

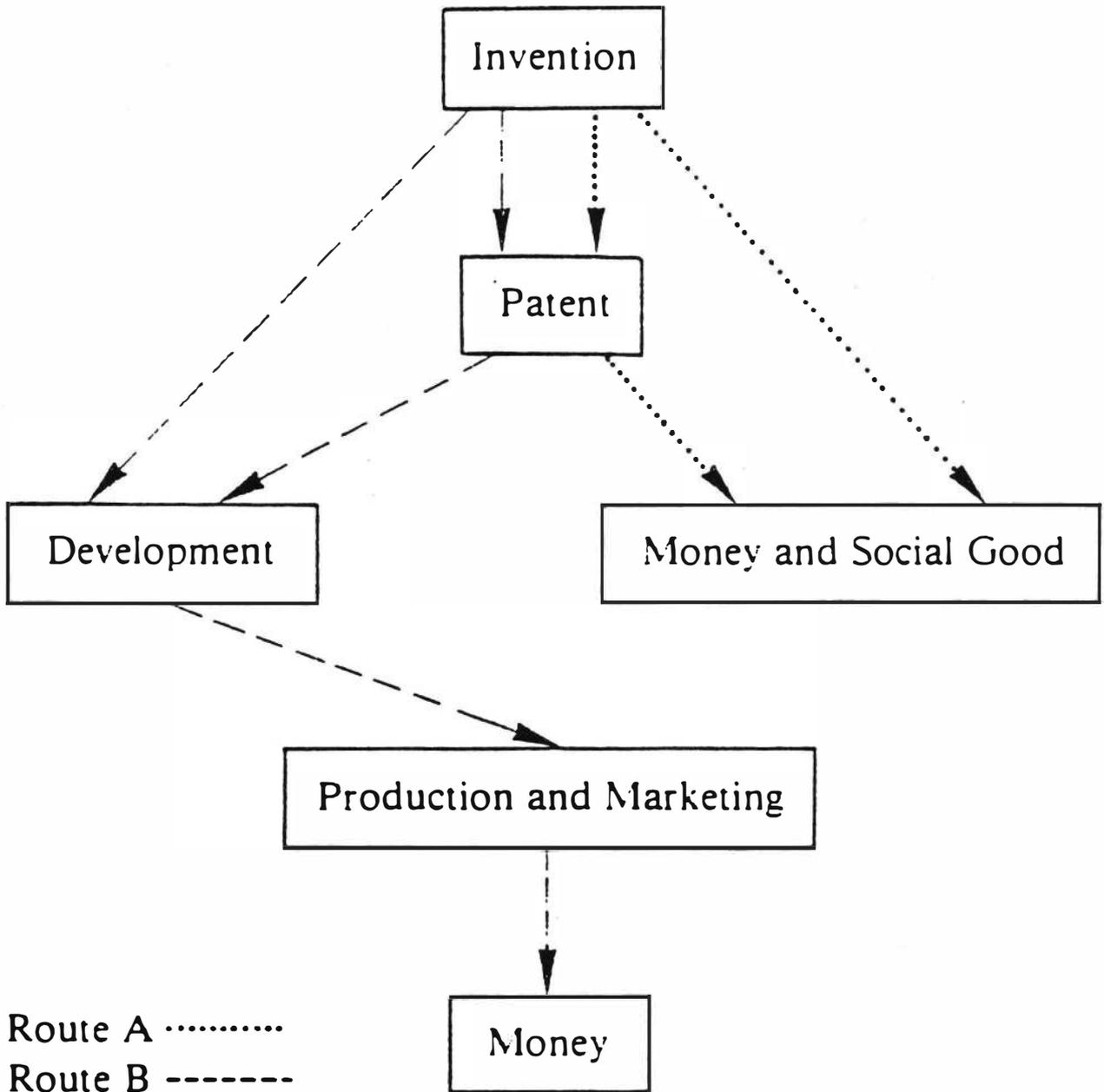


Figure 1—Individual Inventors' Apparent Perception of Events After Invention

TABLE 6

INDEPENDENT INVENTORS' SOURCES
OF TECHNOLOGICAL INFORMATION

	Responses	% of respondents
Industry	214	48
Books	211	48
Technical and trade journals	204	46
Newspapers and magazines	99	22
Other independent inventors	94	21
Television and radio	65	15
Universities and colleges	49	11
Government research laboratories	34	8
Other government sources	23	5
Conferences and seminars	23	5
Domestic patent specifications and abstracts	21	5
Overseas patent specifications and abstracts	10	2
Total responses	1047	
Total respondents		442

Note: Inventors were asked to indicate their three main sources.

Source: As for Table 2.

ADVERSITY AS A STIMULUS

In previous work, I have suggested that the policy implication of the inventor's isolation is that more information should be made available so that independent inventors may better match the fruits of their creativity to the demands of the real world.³⁶ Certainly no one seems to take independent inventors sufficiently seriously to take the trouble to explain. Patent attorneys and officials from the Patent Office or other government departments seem eager only to refer the independent inventor to inventors' associations for advice. On reflection, the suggestion may have been unwise. It assumes that the human qualities of the inventor can be readily complemented with hard information about the cold reality of the innovative process, and that the qualities would still continue to yield as much invention as ever. The assumption is probably wrong: Would an author write as well with the knowledge that his book was unlikely ever to be published? Would a soldier fight as fiercely knowing that he will probably not survive? Does a poet pen the better with the realisation that his rhyme will hardly ever be read? And so it would probably be with independent inventors; the cold truth about the invention's prospects might help improve those prospects, but at the cost of reducing the chances of the invention ever being created. A fair degree of childish enthusiasm and unworldly innocence is probably an essential component of the human qualities of independent inventors.

There is also cause to doubt whether the informed independent inventor could do much more to improve his lot than the uninformed inventor. Amongst the inventor's human qualities must be the ability to operate within a system in which he just does not fit. Whether they are ostracised as

cranks or merely ignored as irrelevant, independent inventors require a peculiar strength of character to persist. While it is often argued that helping the inventor to fit better into the social and economic system would ease his burden, it may be that this is simply not possible. It may be that the difficulties which face the independent inventor are actually intractable and that he will continue to need all the force of character he can muster. If this is so, then what is often labelled eccentricity or irrationality in independent inventors may in fact be a very natural and logical reaction to an impossible situation. Consider some of the paradoxes with which the independent inventor is faced.

- Independent inventors enjoy inventing and want nothing more than to remain inventing, yet to justify their inventing they must endure the trials of development, production and marketing, areas in which they generally do not excel. They must succeed where they are inadequate and have little support in order to have support for what they do best.

- Independent inventors rarely have the means to exploit their inventions and must approach organisations. Firms have difficulty incorporating contributions from outsiders if there is poor accord with what the organisation is already doing--or if there is excellent accord and the organisation really should have devised the invention itself (what is called the "non-invented-here" syndrome).

- Independent inventors tend to invent in areas not well covered by firms, and where there might be market niches, and yet firms think most highly of those inventions which are in direct competition with their own.

- Independent inventors must have extraordinary perseverance in order to secure exploitation of their inventions, yet the more persistent they are, the more they are seen as a nuisance and the more perseverance is required.
- Independent inventors look to the patent system to protect their intellectual property in return for public disclosure of their information. Unlike organisations, they generally have no alternative to disclosure if they seek exploitation of their inventions, and desperately need legal protection. Yet the patent system is expensive and complex for individuals, and, in practice, affords those who most need publication and protection least of either.
- Independent inventors are frequently told that they should match their supply of inventions much better to economic demand. Yet, the chief advantage of the independent inventor is that he operates untrammelled by convention, by institutional constraints and preconceptions. His value to society is as a free agent, and yet he is encouraged to be less free in order to be more useful.
- Independent inventors officially perform no R&D, yet R&D is commonly assumed to be essential for worthwhile invention. Thus it is difficult for independent inventors to have their inventions accepted as worthwhile. If they have an accepted benefit, it is only because they are seen as being produced at zero official cost. Performing officially recognised R&D would increase the perceived value of what individual inventors produce, but to have their investigative effort in any way recognised as R&D would actually reduce their productivity as it is calculated, and lower the net value of their output.³⁷

CONCLUSION

It is not just that the real world presents difficulties for the independent inventor--it does that for all of us--but that there is really nothing much he can do about the situation. He is trapped in a series of paradoxes. Small wonder, then, that his instinctive response is, in one way or another, to isolate himself from such a hostile environment, to assume the role of crank, to carry on regardless of what the world thinks, to exploit the position of outcast. Such characteristics are, of course, associated with the drive to invent, yet it is generally assumed that this creative drive is innate in only a few individuals and that little can be done to alter the supply of invention. So interest hovers round how a given supply may have more economic impact; sporadic interest, for opinion is widespread that the costs of selecting and exploiting independent inventions far exceed their worth.³⁸ From this stance, progress seems to lie in helping the independent inventor to be more worldly and in making the world more conducive to independent inventions--but always the supply of inventions and the necessary human qualities are seen as an exogenous constant.

The suggestion here is really quite radical: it is that the hostile world plays an instrumental part in creating or stimulating the human qualities associated with invention. Making the world more friendly or the inventor more familiar with its pitfalls would then only reduce the stimulus for the individual to invent. If the mountaineer were reduced to climbing foothills with little risk to life and limb, there would probably be similar atrophication of human qualities; and so with the athlete able to win his event without exertion, or the favoured son who need never make his own way in the

world. The independent inventor is basically a very ordinary sort of person, with very ordinary human qualities--just like the rest of us. What makes him different is that his inventing forces him to accept a challenge, to be different. Make independent invention a normal part of the social and economic system, and much of the challenge disappears; and with it the stimulus to the human qualities responsible for invention. Far from producing more invention, efforts to help independent inventors may well stifle the very human qualities they seek to encourage.

Notes:

- 1 See Barkev S, Saunders, 'Some difficulties in measuring inventive activity' in National Bureau of Economic Research, The Rate and Direction of Inventive Activity: Economic and Social Factors, Princeton University Press, Princeton, 1962, pp. 53-77.
- 2 Individuals were issued 81% of U.S. patents in 1901, but their share had declined by 25% by the sixties. F.M. Sherer, Industrial Market Structure and Economic Performance, Rand McNally, Chicago, 1980, p. 440. See also J. Jewkes, D. Sawers and R. Stillerman, The Sources of Invention, W.W. Norton, New York, 1969, pp. 88-89.
- 3 Early acknowledgement of this trend is in J.A. Schumpeter, Capitalism, Socialism and Democracy, George Allen and Unwin, London, 1947, pp. 131-134; J.K. Galbraith, American Capitalism: the Concept of Countervailing Power, Houghton Mifflin, Cambridge, 1952, pp. 90-95.
- 4 The author does not. See Stuart MacDonald, 'Technology beyond machines' in E. Rhodes and D. Wield (eds), Implementing New Technologies, Basil Blackwell, Oxford, 1985, pp. 41-49.
- 5 A similar, though less extreme, problem exists in measuring R&D in small firms. Alfred Kleinkecht, 'Measuring R&D in small firms: how much are we missing?', Journal of Industrial Economics, 36, 2, 1987, pp. 253-256. See also Byron M. Vanderbilt, 'The plight of the independent inventor', IEEE Transactions on Professional Communication, PC-22, 2, 1979, pp. 63-67.

- 6 Stuart MacDonald, The Individual Inventor in Australia, Department of Economics, University of Queensland, February 1982, pp. 7-8.
- 7 A tentative approach is made in Stuart MacDonald, 'The distinctive research of the individual inventor', Research Policy, 15, 1986, pp. 199-210.
- 8 J. Jewkes, D. Sawers and R. Stillerman, op. cit.; W.F. Mueller, 'The origins of the basic inventions underlying Du Pont's major product and process innovations, 1920 to 1950' and J.L. Enos, 'Invention and innovation in the petroleum refining industry' in National Bureau of Economic Research, op. cit., pp. 323-346 and 299-321; W.D. Reekie, 'Patent data as a guide to industrial productivity', Research Policy, 2, 1973, pp. 246-264.
- 9 F.M. Sherer, op. cit., p. 350; M. Gibbons and R. Johnston, 'The role of science in technological innovation', Research Policy, 3, 1974, pp. 220-242.
- 10 Thomas Mandeville and Stuart MacDonald, 'Innovation protection viewed from an information perspective' in William Kingston (ed.), Direct Protection of Innovation, Kluwer Academic, Dordrecht, 1987, pp. 157-170.
- 11 E.g., Leonard de Vries, Victorian Inventors, John Murray, London, 1971; Leo Port, Australian Inventors, Cassell, Stanmore NSW, 1978; Edward de Bono (ed.), Eureka! How and When the Greatest Inventions Were Made, Thames and Hudson, London, 1974.
- 12 See Giorgio Sirilli, 'Patents and inventors: an empirical study', Research Policy, 16, 2, 1987, pp. 157-174.
- 13 Nigel King and Michael A. West, 'Experiences of innovation at work', Journal of Management Psychology, 2, 3, 1987, pp. 6-10.
- 14 E.g., F.M. Sherer, 'Firm size, market structure, opportunity, and the output of potential inventions', American Economic Review, 55, 5, 1965, pp. 1097-1125; Arnold Cooper, 'R&D is more efficient in small companies', Harvard Business Review, 42, 3, 1964, pp. 75-83.
- 15 Arnold Cooper and Albert Bruno, 'Success among high-technology firms', Business Horizons, 20, 2, 1977, pp. 16-22; Roy Rothwell, 'Small and medium sized manufacturing firms and technological innovation', Management Decision, 16, 6, 1978, pp. 362-370.

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- 16 See Richard P. Nielson, Michael P. Peters and Robert D. Hisrich, 'Intrapreneurship strategy for internal markets - corporate, non-profit and government institutions cases', Strategic Management Journal, 6, 2, 1985, pp. 181-189; Gifford Pinchot, 'Innovation through intrapreneurship', Research Management, 30, 2, 1986, pp. 14-19.
- 17 See Christopher Freeman, John Clark and Luc Soete, Unemployment and Technical Innovation, Frances Pinter, London, 1982.
- 18 See William J. Broad, 'Novel technique shows Japanese outpace Americans in innovation', New York Times, 7 March 1988, p. 1.
- 19 Michael Gort and Rao Singamsetti, 'Innovation and the personality profiles of firms', International Journal of Industrial Organization, 5, 1987, pp. 115-126.
- 20 Jack Gordon and Ron Zemke, 'Making them more creative', Training, 23, 5, 1986, pp. 30-45.
- 21 See Saul Sands and Kenneth M. Warwick, 'Successful business innovation. A survey of current professional views', California Management Review, 20, 2, 1977, pp. 5-16.
- 22 See T.J. Allen, M.L. Tushman and D.M. Lee, 'Technology transfer as a function of position in the spectrum of research through development to technical services', Academy of Management Journal, 21, 4, 1978, pp. 694-708; David Hutchins, 'Ringing the bell with quality circles', Management Review and Digest, 8, 1, 1981, pp. 3-7.
- 23 See Erik Baark, 'High technology innovation at the Chinese Academy of Sciences', Science and Technology Policy, 15, 2, 1988, pp. 81-90.
- 24 E.g., James Brian Quinn, 'Technological innovation, entrepreneurship and strategy', Sloan Management Review, 20, 3, 1979, pp. 19-30.
- 25 See A.H. Nissan, 'The role of the individual in innovation', in W. Novis Smith and Charles F. Larson (eds), Innovation and U.S. Research. Problems and Recommendations, American Chemical Society, Washington D.C., 1980, pp. 133-142.

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- 29 See J. Taylor and A. Silberston, The Economic Impact of the Patent System, CUP, Cambridge, 1973, pp. 314-315; Nathan Rosenberg, 'Science, invention and economic growth', Economic Journal, 84, 333, 1974, pp. 90-108.
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- 33 Published as Stuart MacDonald, 'The distinctive research of the individual inventor', Research Policy, 15, 1986, pp. 199-210.
- 34 But see Fritz Hirschfeld, 'The inventing urge is alive and well', Mechanical Engineering, 102, 3, 1979, pp. 24-29.
- 35 See, for example, Philip Wylie, 'Driving ambition of an inventor', The Engineer, 260, 1985, pp. 22-23; Sterling North, 'Beating the Feds only the first test for the gasaver', New England Business, 8, 12, 1986, pp. 38-39.
- 36 Stuart MacDonald, 'The individual inventor in Australia', Australian Director, 13, 1, 1983, pp. 44-51.
- 37 See Ray S. Brill, 'Innovation in small business and the small business innovation research program' in Southcon 84 Conference Record, Electronic Convention Inc., Orlando, Florida, 1984, vol. 4, 2/1, pp. 1-3.
- 38 On the problem of separating the wheat from the chaff, see L.J. Hartnett, Big Wheels and Little Wheels, Lansdowne Press, Melbourne, 1964, p. 140; Gerald G. Udell, 'Unsolicited product ideas - a new evaluation program', Research Management, 19, 4, 1976, pp. 14-17; Gerald G. Udell and Michael F. O'Neill, 'Technology transfer: encouraging the noncorporate inventor', Business Horizons, 20, 4, 1977, pp. 40-45.

EVALUATION OF THE HUMAN QUALITIES
NECESSARY FOR INVENTIONS

DISCOVERY, INVENTION AND THE DEVELOPMENT OF CREATIVE POWER

by

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Discovery and invention are the most advanced, dynamic, complicated and significant form of human labor, which promotes technological development and human progress and provides mankind with varieties of magnificent material products and a splendid culture.

Having ushered in a new historic era of advanced development of science and technology, mankind is now faced with the new task of developing human creative power.

Since the beginning of 1984, we have carried out research on "Creative Studies" to develop the creative power of workers and staff members in a number of enterprises in Shanghai. Some initial success has been achieved over the years.

I. The Practice of Creative Power Development

During a visit to the China Science and Technology University, Dr. Tsung-Dao Lee, the well-known Chinese-American physicist, said: "As far as the cultivation of talents is concerned, creative ability is most important." That ability is the individual psychological characteristic that a person demonstrates when he successfully accomplishes certain activities, and also the skill he displays in the process.

Creative power is formed and expressed when human beings are engaged in creative activities such as scientific discovery, invention and innovation, productive labor, business management, and literary and artistic creation.

It has the individual psychological attributes of seeking originality and breakthroughs and also a combination of such non-intellectual factors as motivation, determination, emotion and skill as well as intellectual factors. Creative power is therefore measured by the quality and quantity of the inventions achieved. Every normal person is objectively endowed with creative power, although it may be only latent. Its development depends on the extent of his subjective efforts and his environment. This, then, is an indication of the direction that we should follow in developing the creative power of staff and workers.

Staff and workers have a vast reservoir of excellent creative wisdom. Creative Studies is the science of human inventive and innovative thinking, activities, processes and results. It explores the serial and regular nature of the success of human creative power development and inventive and innovative achievements. When combined with mass inventive and innovative activities, it has tremendous vitality.

We started creative power development activities among the staff and workers of the Shanghai No. 3 Iron and Steel Plant. Invention Science, which is one of the three component parts of Creative Studies, taught them to reveal the objective laws governing inventive activities and processes. In Creativity Science, they learned to understand the theoretical basis of creative studies such as creative spirit, thinking, environment and education. In Invention Engineering, they learned to master the various techniques of discovery and invention. Altogether, 921 core persons were trained and, through them, 2,400 staff and workers learned the inventive techniques. In a period of two years, they generated 31,56 million yuan in economic value.

On the basis of the experience in No. 3 Iron and Steel Plant, we introduced the training program within the municipal workers' technological cooperation network and some large and medium-sized enterprises in the city. This step caught the attention of the various departments concerned in Shanghai.

In March 1985, the Shanghai Federation of Trade Unions, the Shanghai Women's Federation, the Shanghai Municipal Committee of the Communist Youth League of China, the Shanghai Science and Technology Association and the Shanghai Federation of Philosophy and Social Sciences launched a program of creative power development among staff and workers in the city. By the end of that year more than 40,000 persons had attended the lectures and participated in the training. Women workers also took an active part in this program with encouraging success. For instance, 540,000 women took up 34,000 discovery, invention and rationalization proposals. Out of 5,288 major items, 47 created a value of 10,000 yuan or more each, 21 filled in the gaps in technology, and 10 reached the international level. 214 women were awarded the title of "Heroine," with 11 receiving the first prize, 64 the second prize and 139 the third prize.

According to incomplete statistics for 1985, in the 6,789 units where 104,119 discovery, invention and rationalization proposals were made, a total value of 480 million yuan was created. In 1987, in the 6,181 units where 134,590 discovery, invention and rationalization proposals were made, a total value of 840 million yuan was created.

This shows clearly that there are huge reserves of creative power among staff and workers, whose enthusiasm, wisdom and creativity are the sources of vitality that will invigorate enterprises in the pursuance of a policy of reform and opening up to the outside world.

II. Inventive Techniques reveal the Key to Discovery and Invention

Our government and heads of enterprises have paid much attention to the development of the creative power of staff and workers. Regulations on Rewards for Rationalization Proposals and Technical Innovations were promulgated back in the 1950s. In a multi-tiered management system, special offices are established in each bureau, corporation, enterprise and institution, and special personnel are assigned to take charge of the work. Trade unions and Communist Youth League organizations of comparable level also take part in making discovery, invention and rationalization proposals. Moreover, annual financial plans earmark certain funds for experimentation, manufacture, popularization and rewards. This provides a good environment for staff and workers to carry out discoveries and inventions. In order to exchange experience and promote inventive and innovative activities further, the departments concerned often hold discovery and invention competitions and achievement exhibitions. Meanwhile, some mass organizations and Creative Studies researchers have applied invention engineering to the training of workers so as to teach more workers to master inventive techniques.

Inventive techniques are general technical methods that have been explored and incorporated in the whole process of

discovery and invention. They inspire people to find the key to major invention problems and to speed up work. This is an important link in the development of worker's creative power.

According to our sample survey, it is generally believed that, once the inventive techniques have been mastered, the duration of each discovery, invention, renovation and experimentation project can be shortened by one-third and the cost can be reduced by a quarter. According to a sample survey of the inventive techniques applied, the Think Tank Technique accounts for 34%, the Permutation Technique for 32%, the Comparison Technique for 19%, the Hetian Technique for 11.5% and the Initiation, Hypothesis and Control Techniques for 3.5%. The various inventive techniques may be summarily described as follows:

1. Think Tank Technique

Zhuge Liang, the famous Chinese statesman and strategist of the period of the Three Kingdoms (220-265), said: "It is good to draw on collective wisdom and absorb all useful ideas." The technique consists in the following:

(a) Discussion: an appropriate number of participants express their ideas on a predetermined topic. Each speaker is allowed five minutes.

(b) Writing from memory: the participants fill in some forms in five minutes, then read out and discuss them.

(c) Briefing: participants who have been given the topic a week previously, brief others at a meeting on their creative ideas, which are subject to general comment.

(d) Suggestion meeting: five to ten people who know the topic under examination well make suggestions on it.

2. Permutation Technique

Permutation is a mathematical term that can be used to describe any of the following arrangements:

(a) Defect permutation: singles out all the defects of a product so that people can adopt improvement measures in order of importance.

(b) Requirement permutation: presents the requirements of a product and organizes people to make designs to meet those requirements.

(c) Characteristic permutation: presents the special features of a product and indicates the focal points for major redesign.

(d) Crux permutation: presents the problems and locates the solutions to them by way of data analysis.

3. Comparison Technique

This is a thinking process whereby the similarities and differences of things are compared, according to certain standards with other, related things, so that their interrelation may be understood. The technique entails:

(a) Direct comparison of homogenous things.

(b) Indirect comparison of heterogenous things.

(c) Bionic comparison of the functional principles and mechanisms of various biosystems, such as "prototype inspiration."

4. Hetian Technique

This technique was developed by the Shanghai Hetian Primary School. It is also known as "the twelve wise ways."

(a) Enlargement: to increase the three dimensions of the product.

(b) Reduction: to reduce the size of the product or certain parts of it.

(c) Expansion: to expand the shape or function of the product.

(d) Contraction: to reduce the shape and structure of the product.

(e) Change: to change the shape and structure of the product.

(f) Improvement: to improve the shape and structure of the product.

(g) Combination: to combine several products or their parts and functions.

(h) Imitation: to model the shape and structure of a product on that of another.

(i) Substitution: to use substitute materials and methods.

(j) Absorption: to absorb the good features of other parts, structures and products.

(k) Reversion: to reverse the shape or method of the product.

(l) Fixation: to finalize the design, standard and measurement of the product.

5. Imitation Technique

This is a way of producing a better product by modelling it on another product or method by means of imitation, digestion, absorption and improvement.

6. Hypothesis Technique

This generally relates to ideas not yet proved in practice. It is the chief way for people to understand things. Many inventions are made through repetition of the process of hypothesis, demonstration and practice.

7. Control Technique

Control means the ability to manoeuvre and dominate, and can be divided into mathematical model control, process control, link control, functional control, environment control, etc.

Staff and workers who have grasped these techniques have given great impetus to inventive and innovative activities.

III. Rewards for Discoveries and Inventions

Every discovery or invention is an embodiment of human inventive work. It constitutes both material and spiritual wealth. The value of many discoveries and inventions is hard to measure in quantitative terms. Our Party and Government have paid much attention to the inventive work of the working people, as it is clearly stipulated in the Constitution that "the State shall encourage and support citizens' inventive work that is beneficial to the people." Furthermore, the Regulations of the People's Republic of China on Rewards for Discoveries was revised in 1978, and the Patent Law of the People's Republic of China came into force on April 1, 1985. The State Council promulgated Regulations on Rewards for Rationalization Proposals and Technical Innovations, and the Shanghai municipal government also issued Implementation Methods of the Shanghai Municipality for Rewards in respect of Rationalization Proposals and Technical Innovations.

Relatively speaking, the number of discoveries is smaller than that of inventions, but they may both be present in rationalization proposals and technical innovations. Two conclusions may be drawn from an analysis of the Implementation Methods issued by various provinces, municipalities and enterprises:

1. The Contents of Discovery, Invention and Rationalization Proposals

These involve methods of and measures for improving and perfecting the production techniques and operational management of enterprises and institutions, and also the improvement and renovation of machines, equipment, tools, technology, etc.,

commonly known as rationalization proposals and technological innovations. Therefore, they include: organization, institution, methods and approaches in the management of enterprises and institutions; innovative reform and improvement; application and promotion of modern managerial skills, methods and means; quality improvement in industry and projects; development of new products; improvement of product mixes; improvement of crops and animal breeds; technological innovations and application of new technology; diffusion of scientific research achievements; digestion and absorption of imported technology; improvement of tools, equipment, facilities and installations as well as environmental protection, treatment of waste gas, liquid and residues, conservation of energy, medicine, safety and health protection, transportation, storage, computer technology, etc. They contain, within themselves, discoveries, inventions, improvements and innovations, and in the meantime they generate economic or social returns specific to China, and to the individual regions, enterprises and institutions.

The common features of some of the discoveries, inventions and technical innovations in recent years may be summarized as follows:

- (a) Originality: which means something "never seen before" either anywhere in the world or within a certain area.
- (b) Progressiveness: which refers to breakthroughs, innovations and improvement of existing objects.
- (c) Practicality: which means concrete measures that can be implemented.

(d) Efficiency: which indicates that they can bring economic returns to the regions, units, departments or society.

(e) Timing: which means both timeliness and a long period of effectiveness.

2. Reward Standards

According to a statistical analysis of 6,181 units in Shanghai in 1987, the average ratio of reward to created value is 0.9-1.1:100. For instance, of the 842,689,606 yuan generated through inventions, 7,533,678 yuan were handed out in the form of rewards with a reward rate of 0.894%. Rewards for discoveries are given according to the relevant regulations.

Ordinary proposals may be divided into two classes, namely those with calculable annual economic returns and those with non-calculable annual economic returns.

For those with calculable annual economic returns, three reward standards are generally adopted according to the circumstances of the enterprise concerned. The rewards are given together with certificates of merit, prizes or public commendations.

	1	2	3	Unit: RMB yuan
1st Class	2000-3000	2501-4000	3001-5000	
2nd Class	1001-2000	1501-2500	1001-3000	
3rd Class	501-1000	501-1500	501-1000	
4th Class	201- 500	301- 500	201- 500	
5th Class	200 or less	26- 300	200 or less	

Some other enterprises determine the amount of reward according to the following formula, on the basis of the above standards:

Value created x calculation coefficient + basic amount

For example: A value of 300,000 is created; then, 300,000 yuan(value created) x 0.2%(calculation coefficient) + 110 yuan(basic amount) = 710 yuan.

The calculation coefficient is graduated from 0.1 to 0.3%, with 18 grades determined by the different levels of rationalization proposals and technological innovation achievements.

Next there are the reward standards for the class of proposals with non-calculable economic returns.

Unit: RMB yuan

	<u>Type A</u>	<u>Type B</u>	<u>Type C</u>
1st Class	300	240	115
2nd Class	280	215	110
3rd Class	260	190	10

Type A relates to major technical projects that have remained unsolved for a long time.

Type B relates to key technical projects and quality problems that cannot be solved for the time being.

Type C refers to ordinary technical projects and proposals.

Over the past four years, the Creative Studies researchers in Shanghai have edited and published a number of related books totalling over one million Chinese characters. They have achieved fairly good results with the promotion of research on Creative Studies and creative power development activities in a number of nurseries, kindergartens, primary and secondary schools, colleges and universities, enterprises and institutions. Some of the inventions have received State patents and awards, or even top international prizes.

We have also been engaged in friendly contacts and academic exchanges with Creative Studies researchers from the United States of America, Japan and other countries.

We have realized, through practice, that human creative power can be developed, and that Creative Studies research and practice are in keeping with the needs of the times.

HOW TO ENCOURAGE YOUNG PEOPLE TO BE CREATIVE

by

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INTRODUCTION

On behalf of the Ohio Inventors Association in the United States of America, I would like to thank Dr. Arpad Bogisch, Director General of the World Intellectual Property Organization, for the invitation and opportunity to speak here today. Perhaps I can provide some information on my background and orientation in the area of creative, inventive and analytical skills. For two years, I served as the acting executive director of the National Congress of Inventor Organizations. I helped found inventor organizations in Dayton, Ohio and St. Louis, Missouri, in the United States of America. I was born and raised in Dayton, Ohio. My ancestors came from the low lands of Germany and from Yugoslavia. Dayton is well known for a number of inventors. The most famous ones are Charles Kettering and the Wright Brothers. It is the Wright Brothers who invented controlled, powered flight. I am now 45 years old and grew up in a society where English is the dominant language. In 1984, the Dayton, Ohio, inventors' organization developed a program known as "inVenture." More will be said about this program later on. This program has been successfully used for teaching inventive skills to youth in the ages of 12 through 18 years.

PURPOSE OF THE PRESENTATION

The purpose of this presentation is to describe the activities occurring relative to the teaching of creative skills.

These skills are described for young people in the age groups of 5 through 18. The grade levels are often described as grades 1 through 12 counting upward with age.

Creativity is the ability to bring together in an unlikely manner different known things into something new. I believe that creativity is an innate ability that a person is born with. This ability is distributed throughout world societies and throughout time on an equal basis. One of the best definitions of creativity is taken from the following quotation by Alan Ashley-Pitt:

"The man who follows the crowd will usually get no further than the crowd. The man who walks alone is likely to find himself in places no one has ever been before. Creativity in living is not without its attendant difficulties, for peculiarity breeds contempt. And the unfortunate thing about being ahead of your time is that when people finally realize that you are right, they'll say it was obvious all along. You have two choices in life: You can dissolve in the mainstream, or you can be distinct. To be distinct, you must be different. To be different, you must strive to be what no one else but you can be..."

For creativity to flourish and grow within a society, it must function within the general socio-economic system of that country. I believe that we are all becoming aware of the importance of creativity to the betterment and economic well being of every society on this plant earth.

I would like to describe how creativity is stimulated within the United States of America by making reference to

provisions and amendments to the Constitution of the United States of America. These are generally consistent with the Charter, purposes and resolutions of the United Nations. The provision of interest in the Constitution is found in Article I, Section 8: "The Congress shall have power to... Promote the progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries..."

We see that if a country is to have effective programs to promote creativity, invention and development of theoretical thought, then that country must have a socio-economic system that stimulates these activities and above all tolerates the results of creative thinking. Too often it is easy to be critical of thinking that is new and different because it challenges the established socio-economic structure of that country. I cannot stress here strongly enough how important it is for society to tolerate new and different thinking, which we often call creative thinking.

CREATIVE THINKING

The development of creativity within youth and society in general is an individual function. This must be stimulated within an individual on a local level. Directives from a central authority cannot encourage creative thinking effectively. Rather, the individual person within himself must recognize that not only is creative thinking encouraged and tolerated, but adequately rewarded within society. In the sections to follow, I will describe programs that encourage and tolerate the output of creative thinking.

CREATIVE ACTIONS

Creative thinking is a general function that manifests itself in a number of human activities that appear diverse but actually are singular in their source. In the applied arts, creativity is displayed as invention. Inventions are new and useful objects. When these inventions receive some form of legal protection, then we state that a patent has been granted by the inventor's legal system. Creativity also manifests itself in the area of fine arts. Here, we describe fine arts in the areas of music, literature, dance and the decorative arts. The decorative arts include architecture, painting and furniture. Creativity also manifests itself in the area of scientific theory. For example, new theories describing the physics of elementary particles are a manifestation of creative thinking just as a new architectural style is a manifestation of creative thinking.

Within several countries, and particularly within a number of states within the United States of America, a number of programs have been developed to encourage creativity and the development of creative skills. These programs are usually supported by local school districts without national direction, although there is national support. I have found that the strongest programs are the results of individual teachers and school district superintendents. It appears that strong, local enthusiasm within the individual school is the greatest factor in a successful program. A program dictated by national authorities does not generate the type of enthusiasm that comes from an individual teacher or superintendent embracing a creative program. Within the United States, there is a program known as Project XL. This program is often titled "A Quest for Excellence" and is described as "Building a network for

inventive thinking in our nation's schools." This program has arisen from the U.S. Patent and Trademark Office and is supported by a number of national organizations. Its purpose is towards building a network of individuals and organizations concerned with teaching critical thinking skills. Critical thinking skills include not only creative thinking skills but analytical thinking skills. It is generally recognized that in the deterioration of an educational system, it is the critical thinking skills which deteriorates first. The Project XL publishes a catalog of organizations that assist inventors. There are a number of text materials and resource materials available for the teaching of creative and inventive skills. Some of these are designed for the elementary grades for youngsters ages 5 through 12. There are magazines, catalogs and selections of material for gifted and creative children. These materials are quite plentiful and appear to occur in a price range of U.S.\$3 through \$70. There are national publications within the United States and other countries which bring attention to young inventors on a national basis. Not only do these publications serve to interest other people, but they add legitimacy to creative and inventive thinking in youth.

There are also four programs for teaching inventive and creative skills. The first program is known as "Invention Convention" and it is not only designed for grades 1 through 6 but also grades 7 through 9. This program is distributed by Silver Burdett as part of their science series. School districts that cooperate with the textbooks sold by Silver Burdett are able to participate in the Invention Convention. This program allows for local contests within the individual schools. Each school is allowed to submit one invention to a national contest. For three years now, I have judged these contests, and I can assure you that it is very difficult in selecting the top winner.

Another program for teaching creative and inventive skills is known as "Invent America." This program is sponsored by a non-profit foundation acting on a purely philanthropic basis. Extensive materials are available for the students, teachers and administration of the local schools. This program is designed for grades Kindergarten through 8, ages 4 through 13. Extensive educational opportunities are provided to the teachers with a national meeting held every year for teachers from across the United States.

The third program is sponsored by the "Weekly Reader." The "Weekly Reader" is a small newspaper designed for grades 1 through 6. An invention contest is held in each school with the winners going to a national contest. An excellent resource material is provided for the youngsters titled "Be an inventor."

The fourth program for teaching invention and creativity is called "inVenture." This program consists of two text materials, a student guide and a teacher's manual and a two hour videotape containing five programs about creative and inventive skills. This program is sold mostly within the United States of America, but it is actually available on an international basis by purchase from the Inventors Council of Dayton. It is for grades 7 through 12.

In addition to the text materials and invention programs described earlier, there are a number of conferences on a national and international basis to support educators and administrators interested in creative, inventive and critical thinking skills. Such a recent convention was held in June 1988, in Richardson, Texas, U.S.A. This conference lasted for two and a half days and brought together educators from across the United States of America. The Richardson Independent School

District is one of the leading school districts in the United States of America for teaching inventive and creative thinking skills. Another national conference is the "Thinking Skills Conference" and is held in Cincinnati, Ohio, U.S.A. This conference is sponsored by a number of state and national organizations and is held yearly. The last conference I would like to describe is sponsored by the World Council for Teaching Gifted and Talented Children. The most recent conference was the Seventh World Conference on Gifted and Talented Children held in Salt Lake City, Utah, U.S.A. in August 1987. This conference is held every two years and the 1989 conference will be held in Australia.

REWARDS

It is my belief that for a program to succeed in teaching inventive, creative and critical thinking skills, it is necessary for society to provide visible, external rewards for the person possessing and productively utilizing those skills. Some of the above discussion lists national contests for youngsters who can win prizes and attend national meetings. For example, the first place winner of the "Invention Convention" receives a personal computer and travels to the annual meeting of the National Science Teachers Association in the United States of America.

Inventors of any age group have the ability to display the results of their creativity and inventions in Washington, D.C., in the spring of each year. The most recent conference was held in March 1988, and titled "Innovation and Creativity." Along with this conference, there was a National Inventors Expo '88 on March 26-27, 1988. For the nominal fee of U.S.\$100,

an inventor at any age level can bring his invention to this national show. Additional national shows exist in other countries and I will be describing them later in this presentation.

A number of programs exist in several countries to assist adult inventors. It may, at first, seem inappropriate to describe such programs in a talk describing creativity for youth. It must be recognized that adults serve as models for youngsters and youngsters quickly recognize the rewards that will come to them as they mature. There are a number of programs to assist inventors in the invention field. The first one is in Canada and is known as the Canadian Industrial Innovation Center. This organization produces a newsletter titled "The Innovation Showcase." This publication contains general information to assist creative inventors and also provides a showcase for important inventions. Within the United Kingdom, there is a conference sponsored in Birmingham, England, known as the International Inventors Pavillion. It is sponsored as part of the "Technology Transfer Exhibition."

Within the United States of America there are a number of publications designed to assist individual inventors and originators of creative thought. A number of publications exist such as "Inventor U.S.A.", "I.P.O. News" and "Inventor's Digest." Additional articles appear in the Wall Street Journal and the publications of the "Inventors Workshop International Education Foundation." A particularly valuable publication is titled "How to protect and Benefit from Your Ideas" and is available from the American Patent Law Association. Please recall my earlier comments that referred to a section of the U.S. Constitution establishing a patent system. Much of the information contained in this publication is related to the constitutional guarantee and establishment of a patent system.

An important aspect of teaching inventive and creative thinking skills is to examine creative and inventive thought on a historical basis. A good source of information is an examination of local and national inventors who have contributed significantly to the social and economic development of that country. Within the United States, we have "The National Inventors Hall of Fame." Each year the Hall of Fame inducts three or four inventors who have contributed to the national and economical well being in some outstanding manner. A quick examination of the inductees in this Hall of Fame clearly demonstrates their contributions to society on an international basis. Interestingly, many of these inductees have been born outside of the United States of America.

SUMMARY

In looking at the teaching of creative thought within various countries, we must recognize that creativity is actually an ability that exists at birth. It is society that constrains and represses creative, inventive and critical thinking skills. As we enter a true world economy and international banking, we must recognize that each of our societies must compete in an efficient manner to ensure the economic security for us, our families and our contry. We must make use of all the national resources that exist within our boundaries. There is no greater national resources than the creative, inventive and critical thinking skills of our respective populations. It is very easy to destroy these by repressing them within an educational system or within a social structure that does not adequately encourage, develop and reward such abilities. In establishing programs to enhance and

develop creative skills, we must also recognize that society in general must: (1) allow for creative thinking; (2) tolerate the outputs of creative thinking; and, (3) reward the constructive outputs of such thinking.

HOW TO STIMULATE THE CREATIVE POWER OF YOUTH

by

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In youth lies the hope of a country. With their quick minds, rich imaginations, sharp insight and strong sense of responsibility, they constitute a vital new force in making discoveries and inventions. China has more than three hundred million young people in a population of one billion. Therefore, how to stimulate the creative power of youth, raise the level of their creative power and utilize to the full their wisdom and intelligence is a major question that will determine whether or not our country can quickly become prosperous and developed. This paper discusses the question of how to stimulate Chinese youth's creative power in conformity with their conditions and characteristics.

The Chinese nation is a great nation. Its people are known to be intelligent, industrious, modest and eager to learn. From their protracted struggle against nature, they have accumulated much experience, together with sharp insight and penetrating thinking. The Four Great Inventions, the Great Wall, Zhaozhou River Bridge and Dujiang River Dam, to name just a few, are all manifestations of the Chinese people's wisdom and intelligence. Chinese youth have even greater creative power. After the first controlled flight with a heavier-than-air machine by the Wright Brothers in 1903, 27-year-old Feng Ru from China, in a flying contest held by the International Aviation Association in San Francisco in 1910, came off with flying colors in an aeroplane made by himself, creating global headlines at the time. It was a demonstration of the Chinese people's wisdom and ability in flying. Qiu Chengtong was only 28 when he won the Fields Medal, the highest in international mathematics circles, for solving a major

conjecture in differential geometry. When the great man of medicine of the Ming Dynasty, Li Shizhen, began to compile the Compendium of Materia Medica, he was 35. Ni Zhifu was just 20 when he invented the "mass drill bit" in 1953. In short, in the history of world civilization, Chinese youth have demonstrated rich creative power. They have made outstanding contributions to their brilliant ancient culture and to world scientific and technological development.

However, China experienced long feudal rule that lasted several thousand years, and especially in modern times, the invasion of the imperialist powers reduced China to a semi-feudal, semi-colonial society. The shackle of the feudal rule that lasted for so long and the loss of sovereignty suppressed the creative power of the Chinese nation so that China, which used to be one of the most developed countries in history, was left lagging behind the developed western countries. Since the founding of the People's Republic, the Chinese people have been freed from semi-feudal, semi-colonial rule and have adopted socialism, rejuvenating this ancient country. But the New China was born out of the old society, and feudal ideas and some other errors in our work have prevented the fullest expression of the rich creative power possessed by Chinese youth.

Our backward economy and low industrial level, which fail to provide the best environment for young people to display their creative power, also hinder the development of this power. Our educational structure puts emphasis on imparting knowledge to students from primary school up to university without giving adequate attention to the development of their

intelligence and creative power, thus also hampering, to varying degrees, the expression of our youth's creative thinking and imagination.

Taking into account the characteristics of Chinese youth, we believe that we should base ourselves on the following aspects in order to stimulate their creative power and raise the level of their creation.

I. Emancipation of the Mind

In order to develop youth's creative power and emphasize their role in discoveries and inventions, the first important step is to emancipate the mind and cultivate their confidence by removing psychological barriers to the development of creative power. Youth should be made aware that discoveries and inventions are not something unfathomable beyond their ability. In fact, all normal persons are endowed with creative power potentials which can be cultivated and developed. Creative power means the ability to engage in active creative thinking in conformity with the goal and the task, and to re-synthesize knowledge and experience so as to cultivate new awareness, thinking, ideas and results. The key here lies in emancipation of the mind. To make an invention, one must have enterprising spirit and press forward in the face of difficulties. Confidence and diligence are the basis of and prerequisite for the stimulation of creative power. For instance, there was a young scientific and technological worker at Jilin Industrial University, who, after graduation, was employed by the university to design a connecting-rodless engine with a renowned professor there. According to the original scheme, the synchronous device of the crank block

would use a combined gear pair, which entailed high precision and cost in processing and assembling. In addition, the gear ring, once under pressure, would exert a moment of force on the piston, aggravating the friction and wear and tear, and the piston could damage the gear under an impulsive load.

Therefore, no satisfactory results were achieved for several years. Subsequently, the working environment changed and the young worker was left alone to do the work. In face of the financial and other difficulties, should he continue or not? He was not daunted by the difficulties; he pressed forward and resolved to do it. Having gathered a great deal of information and consulted domestic and foreign patent documents, he made a comprehensive analysis and résumé, and it took him just one year to draw up a dozen or so schemes. After experimentation, he made four patent applications. One of them was a crank and slipping block mechanism reciprocating a car piston compressor, for which he received a gold medal at the Third National Exhibition of Inventions and a special Changbai Heavenly Pool prize. It is now being produced by a dozen or so factories in seven provinces, generating a total output valued at more than 10 million yuan. So far, he has made eight patent applications and has been granted four patents.

Some young people often complain that they lack creative inspiration. As a matter of fact, inspirations are not unfathomable mysteries, they are merely a special form of thinking. When you have doubts about or feel discontented with the existing theories, technology or equipment, your strong sense of responsibility and competitive awareness may stretch your memory, insight, imagination and mind to the maximum limit so that in the repetitive process, you may suddenly come across new images, ideas and plans and find all the problems readily solved.

II. Relaxed environment

Inventions are the result of interaction between the inventors and the environment. It is difficult to achieve creative power through the subjective factors alone, without a suitable environment and conditions for discoveries and inventions.

Environment here refers to both overall and local environments. By overall environment, we mean the macroscopic social environment, which includes the country's political institution, economic structure, science and technology policies, personnel management system and academic practices. The macro environment has a tremendous impact on the stimulatoin of creative power.

After the convening of the national science conference in 1977, and especially since the 3rd Plenary Session of the 11th Central Committee of the Communist Party of China, which adopted a strategic policy emphasizing that economic development must rely on science and technology and that the latter should, in turn, be geared to the former, we have ushered in a golden period of scientific and technological development. Things that were wrong have been set right, and a new social mood of respect for knowledge and talent has emerged. This has created favorable conditions for people to use their creative power and for the rapid development of science and technology.

However, in the same macro environment, difference between the local environments of individual units also have

important effects on creative power. We may take the following as an example: a very creative person feels he is not valued and cannot use his ability in unit A, but when transferred to unit B, he finds ample scope for his ability, and is maybe even short of energy to match it. This shows that the leadership's style of work, the composition of the personnel, scientific and technological practices and other factors have a lot to do with creative power. Therefore, the leaders of a unit must be good at discovering young talents and must welcome people of ability.

III. Guaranteed Conditions

Science and technology have developed to such an extent today that considerable means and conditions are necessary to improve them and raise them to a higher level. Constrained by their lack of seniority and fame, young people may find it rather hard to obtain financial support to realize their inventive ideas, and it is, therefore, imperative to provide them with certain material conditions. We must stimulate the creative spirit and motivation of young people in a practical way, arouse their curiosity and thirst for knowledge, and activate their creative thinking and imagination. For example, last year, Jilin Industrial University set up a Youth Scientific Research Fund and an "Award for New and Original Academic Ideas" for youth, which help bring into play the enthusiasm of young teachers, graduate students and undergraduate students for discoveries and inventions. A very lively inventive and academic atmosphere was created: someone proposed a Chinese lunar vehicle, and another put forward a new theory on bionic management. In the short span of one year, more than 100 original topics were proposed and financial

support was given to those selected. So far, some of the projects have passed technical assessment, two have been awarded gold medals at the Third National Exhibition of Inventions, and seven applications have been forwarded to the Chinese Patent Office. The papers on several projects have been read at international seminars.

IV. Training in Techniques

Different work needs different methods. Creative work needs creative techniques, by which we mean scientific methods to bring all positive human factors into play so as to enhance creative power. In creative studies, the United States and Japan now place the emphasis on inventive techniques. Practice has proved that it is possible to increase creative power through invention engineering education and practice. Invention means solution of a problem in a creative way. This may be a scientific discovery, a technical invention or a literary or artistic creation. The thinking process involved in the solution of a given problem may be roughly divided into four steps, namely, to identify the problem, to analyze it, to propose ideas on how to solve it, and to verify these ideas. Therefore, the solution of the problem in a creative way must be based on human effort. Basic knowledge, comprehensive information and effective techniques are indispensable for inventions.

Wan Li, Chairman of the Standing Committee of the National People's Congress of the People's Republic of China, pointed out: "To cultivate a new type of talented people, it is very inadequate to stress the traditional educational ideas

of imparting knowledge and the cramming method of teaching alone. This does not mean there is no need to impart knowledge. In education we, of course, need to pass on existing knowledge to the new generation. But what is more important is to cultivate the students' ability for independent thinking, and for solving new problems by applying their knowledge, as well as the scientific way of thinking to acquire new knowledge, sum up new experience and develop new theories."

Some schools offer courses on inventive studies, while industrial enterprises have run various forms of training classes on inventive techniques with fairly good results. Take the invention of the gas-shielded sand blower for example. The chief defect of the existing sand blower for industrial use is the short life of the blast nozzle, which quickly shows signs of wear and tear because of the abrasives gushing from the nozzle at high speed. Attempts were made to improve the nozzle by using different materials, but it was hard to find stronger materials. Besides, it would increase the cost while the effect would be insignificant. The inventor failed to make any major breakthroughs for several years, but then the study of inventive techniques made him suddenly see the light: could he adopt a different approach and design a nozzle free from wear and tear? Subsequently, proceeding from the origin of the problem, he studied the principle of air flow and finally came up with a gas-shielded blast nozzle. Tests proved that it would prolong the life by more than 200 times, a major qualitative improvement that earned him a gold medal at the Third National Exhibition of Inventions.

Since 1983, some of the well-known big enterprises in China such as the Shanghai No. 3 Iron and Steel Plant, Nos. 1

and 2 Motor Vehicle Plants, Shanghai Petrochemical Complex, as well as 38 major factories affiliated to the Ministry of Railways, have launched technical training in invention engineering among their workers and staff members. It has produced significant effects in promoting the development of new products, technical transformation and innovation, and has increased the production and income of the enterprises. Shanghai No. 3 Iron and Steel Plant alone gained 30 million yuan in 1986.

V. In Conformity with Social Needs

All inventions must proceed from social needs or they are doomed to failure. For instance, the great American inventor Edison, as a result of the over-elaborate voting procedure in Congress, invented and patented an electrographic vote recorder, the first patent in his career as an inventor. But it proved to be a devastating failure because the opposition party in Congress badly wanted to keep this over-elaborate voting procedure as a procrastination tactic. The defeat taught him that social necessity was the mother of invention. Young people will have greater enthusiasm for inventions and courage to overcome various difficulties if they are informed in time of the State's policy and social needs so that they can focus on real social problems. Young inventor Zhou Lin, when seeing tens of thousands of frostbitten patients suffering miserably because there was no ideal therapy for it, was determined to design a device for frostbite treatment to relieve them of the pain. He defied all kinds of pressures and the nickname "a vagabond of science and technology." In spite

of his poor health, he made numerous tests on his own body. All he had in mind was to meet the social need. When the No. 1 Motor Vehicle Plant began to switch to the production of a new model of the "Liberation" lorry, the 37,000 auto workers placed the revitalization of China's auto industry above everything else. The young workers were organized into shock brigades or task teams based on Communist Youth League branches and committees. Each small project was handled by one or two shock brigades, while a major one was tackled jointly by several or a dozen shock brigades. For that purpose, some of them postponed their marriages, and some even gave up taking care of their sick wives. In just a few years' time, they tackled more than 10,000 difficult problems and made tremendous contributions to the remodelling work.

VI. Publicizing Achievements

Young people hope the public will know about their achievements, understand their work and recognize their value. Therefore, we must give publicity to their inventive achievements so that they can compare their work with others and exchange experience, which will help further arouse their enthusiasm for inventions.

The annual exhibition of inventions sponsored by the Chinese Association of Inventions offers them a good opportunity. According to a survey of the 1st, 2nd and 3rd national exhibitions of inventions, the percentage of items by young inventors has been steadily growing.

Furthermore, before each national exhibition, local exhibitions and exhibitions of small inventions, designs,

modifications, suggestions and projects at different levels are held throughout the country, providing young people with more opportunities.

VII. Clear-Cut Policy

The key to stimulating the creative power of youth lies in the right policy. Our system of rewards for inventions and scientific and technological progress has played a certain role in encouraging and promoting discoveries and inventions.

The establishment of the patent system and the enforcement of the Patent Law have contributed actively to arousing the creative power of youth and have provided them with favorable conditions for making discoveries and inventions. Our Patent Law protects the patent rights for inventions, utility models and designs. The latter two are especially popular among youth because they do not demand much creativity. Of such patents already approved, some are the work of primary and middle school students.

Taking the total number of patents as a whole, we are still lagging rather far behind the few major patent countries of the world, but considering the fact that our patent system was only set up three years ago, the great number of discoveries and inventions in such a short time is something rarely seen in world patent history. This indicates the vast potential for discoveries and inventions in China. Therefore, so long as we vigorously publicize the Patent Law to give legal protection to patent rights for discoveries and inventions, and so long as we break through all barriers and liberate our

thinking so as to encourage those at all levels to conduct extensive training in inventive techniques, we will be able better to stimulate the creative power of youth.

To sum up, Chinese youth possess a great potential for invention. As long as we give them correct guidance, provide them with the conditions for making inventions and carry out the necessary education and training, they will be able to make even greater contributions to our modernization program.

HOW TO ENCOURAGE INVENTORS IN ENTERPRISES

by

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Employees' invention systems adopted by enterprises were primarily set up as a system of compensation for inventions of employees, but now they also serve as one of the positive factors for supporting inventive activities in enterprises.

Today I would like to report on the current state of the employees' invention system in Japan as a system for supporting inventive activities, based on a recent investigation conducted by the Invention Research Institute of the Japan Institute of Invention and Innovation (JIII) on its own initiative and which can be summarized as follows: period of investigation: September 10, 1986, to October 20, 1986; subject of investigation: 220 enterprises and 23 research institutes.

The investigation was conducted first using questionnaires and thereafter interviews were made based on the results of the questionnaires.

I. Employees' Invention System and Suggestion System

In order to train engineers to become inventors, it is always necessary for them to be given the appropriate training. Creative engineering is a field of study which can provide procedures for such training, and it has been actively studied and put into practice in recent years. On the other hand, it is also important to provide an environment which

helps the engineers to make inventions. Although it is recognized that factors such as "interest" of engineers, "enthusiasm" of managers or "psychological pressure" on engineers may be effective prerequisites for the creation of new ideas, more systematized and scientific measures should be taken for this purpose.

The suggestion system, or in other words the so-called "O and M" (organization and method) system, is the measure taken by most of the enterprises for this purpose. It should be noted that, particularly in Japanese manufacturing enterprises and research institutes, the employees' invention system and study committees related to that system constitute nuclei of their technical development strategies.

The employees' invention system originated during the creation and development of the suggestion system (or O and M) and has been developed together with that system.

The first suggestion system appearing in history is believed to be the one put into effect in the Denny Dockyard (William Denny, shipbuilder) in Scotland in 1880. That system had two-sided objectives for promoting both labor management and technical development. The system presently found also has such two-sided objectives, but a greater importance is put on the latter.

2. Introduction of Employees' Invention System

As a result of the above-mentioned investigation, it was found that the percentage of enterprises having an employees' invention system was as high as 96%, while it was 73% in 1979.

Figure 1 shows the number of Japanese enterprises that have formulated provisions on employees' invention systems and the year in which they were adopted. It is apparent that the number of enterprises has increased rapidly since 1960. This increase is due to the fact that provisions on employees' inventions were expressly provided for by the Japanese Patent Law and development of technologies was activated together with the economic growth in these years.

In reply to the question on the main reasons for adopting the provision, 92.9% of the replying enterprises mentioned the motive of encouraging employees to make inventions. It can be seen from this fact that the employees' invention system has been well rooted in Japanese enterprises as a positive measure for promoting employees' inventions (see Fig. 2). Further, as is apparent from Figure 3, small enterprises have a tendency to attach more weight to research and development activities.

3. Effect of the Employees' Invention System

In Figure 4 various effects are arranged in order of merit. It can be seen how important is the role that this system plays in promoting inventions. In fact, much incentive is given to the engineers by evaluating correctly and compensating appropriately their successful achievements according to the system.

Evaluation of inventions is one of the most important tasks in patent management.

Figures 5 and 6 give details of evaluation of patents.

Referring to Figure 5, higher marks are given to the following items: No. 2, "originality of invention or device"; No. 3, "extent of monopoly of the right"; and No. 12, "technical value obtained by working inventions." The occasions when the inventions are evaluated in the course of obtaining patent rights are "when applications are filed," "when requests for examination are filed," "when patents or utility models are registered," and "when inventions are put into practice by the enterprises themselves," according to the majority of answers to the questionnaires.

It also can be said that, in an enterprise, several divisions or special committees other than the patent division are also in charge of evaluating inventions at various stages of their development and that they cooperate in this work as one of the strategies of the enterprise. Table 1 shows, as an example, divisions in charge of various stages of evaluation in a particular enterprise.

4. Employee Reward System

Figure 7 shows the percentage of enterprises having adopted an employee reward system among all the enterprises investigated in the present research. Details of the system were also investigated and Figure 8 shows criteria for rewarding employees for their inventions, devices or creations. It is notable that originality follows economic value as the most important criteria.

Referring to Figure 9 showing effects which are brought about by this system, many enterprises replied that the system is very effective in encouraging employees to exhibit their

originality and ingenuity. Thus, it can be said that the system has a great importance in promoting inventive activities systematically.

The reward system is not limited to private enterprises. Inventors as well as entrepreneurs will be greatly honored if they are rewarded by the Government or authoritative organizations. Such honor is a great incentive not only for managers and executives but also for employees.

In Japan, we have some national prizes such as the Purple Ribbon Medal and the Blue Ribbon Medal.

In particular, the national prizes for achievements in scientific and technological fields are some of the most important awards in our country. In addition, the Government (the Science and Technology Agency) has some systems for rewarding notable inventions and deserving persons. Further, the JIII has had the System of National Commendation for Invention since 1919 that rewards inventors for inventions which are effective and have been actually worked successfully in industry. This system has authority as the oldest system in Japan and as the prize awarded by the Imperial Family.

Figure 1: Years of Formulation of Related Regulations

(205 samples)

Number of Enterprises

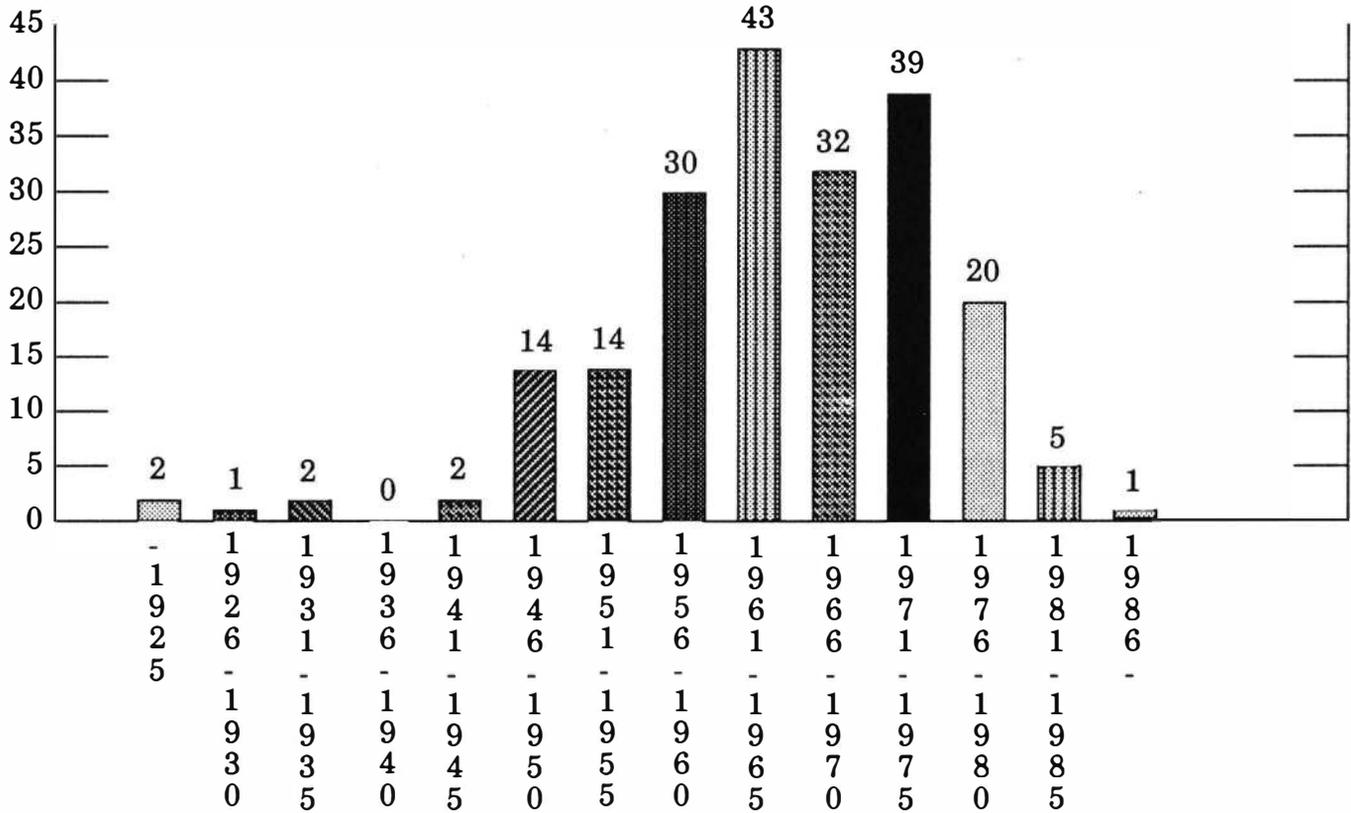


Figure 2: Motives for Adopting Regulations
 (multiple answers allowed)

(212 samples)

(Enterprises)

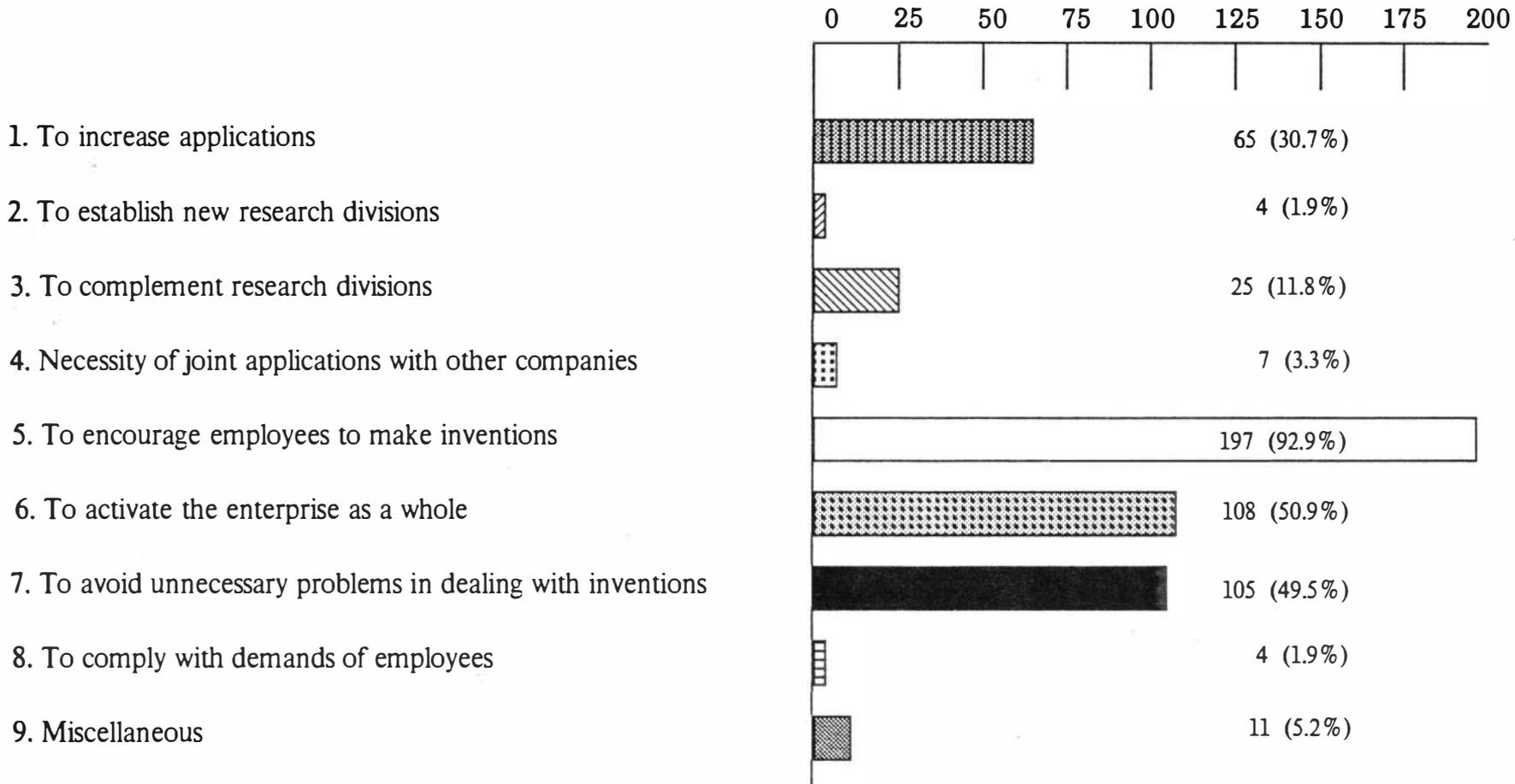
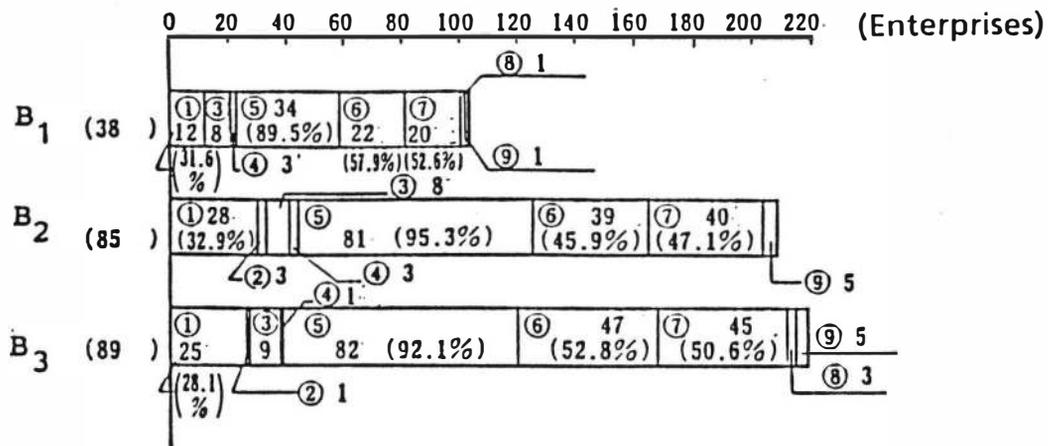


Figure 3: Motives for Adopting Regulations
Classified by Scales of Enterprises

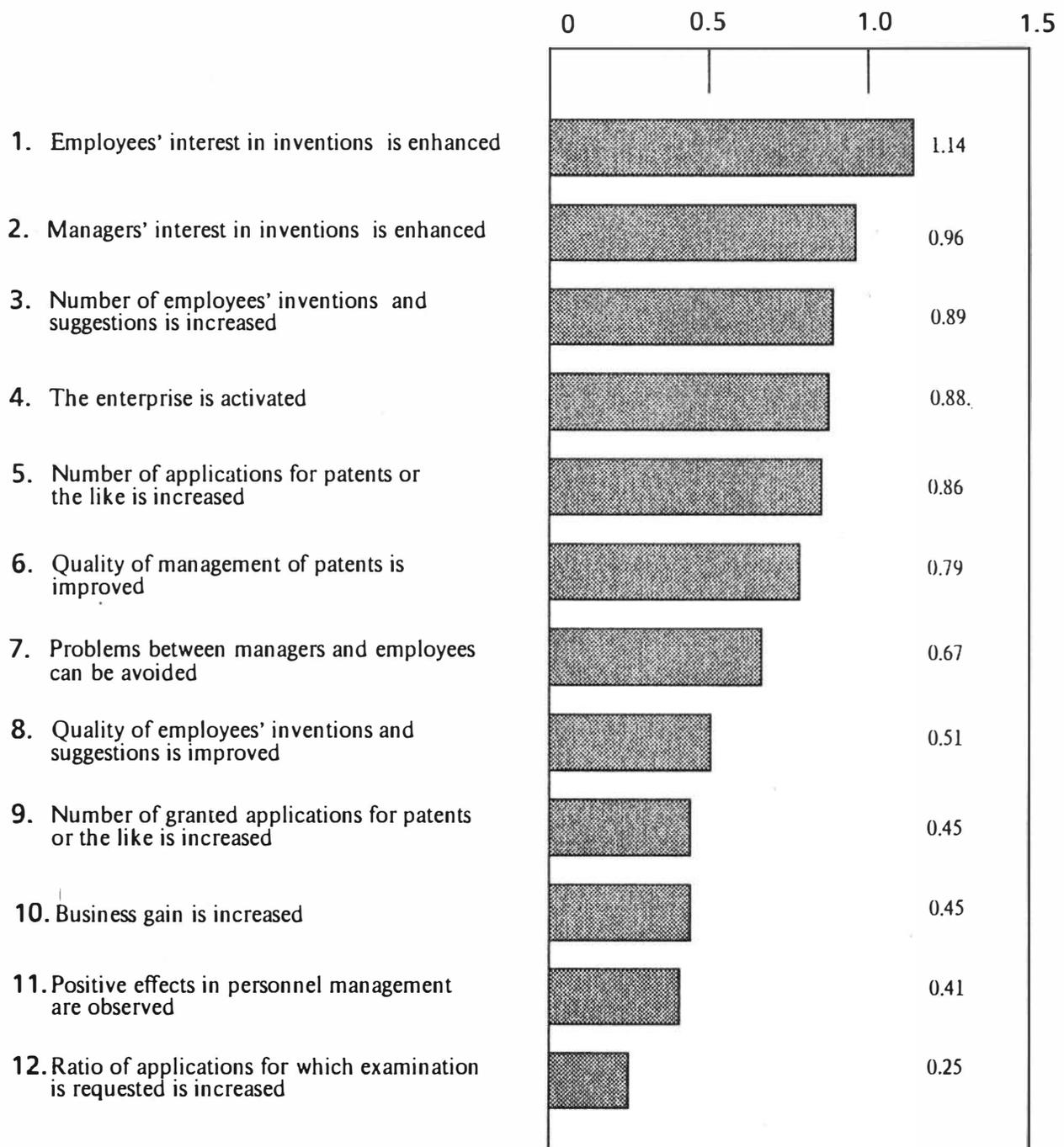


- B₁ (less than one billion yen)
- B₂ (from one billion to 10 billion yen not inclusive)
- B₃ (10 billion yen and over)
- ① To increase applications
- ② To establish new research divisions
- ③ To complement research divisions
- ④ Necessity of joint applications with other companies
- ⑤ To encourage employees to make inventions
- ⑥ To activate the enterprise as a whole
- ⑦ To avoid unnecessary problems in dealing with inventions
- ⑧ To comply with demands of employees
- ⑨ Miscellaneous

Figure 4: Effects of Adopting Regulations on Employees' Inventions

(207 samples)

(Merit Marks)



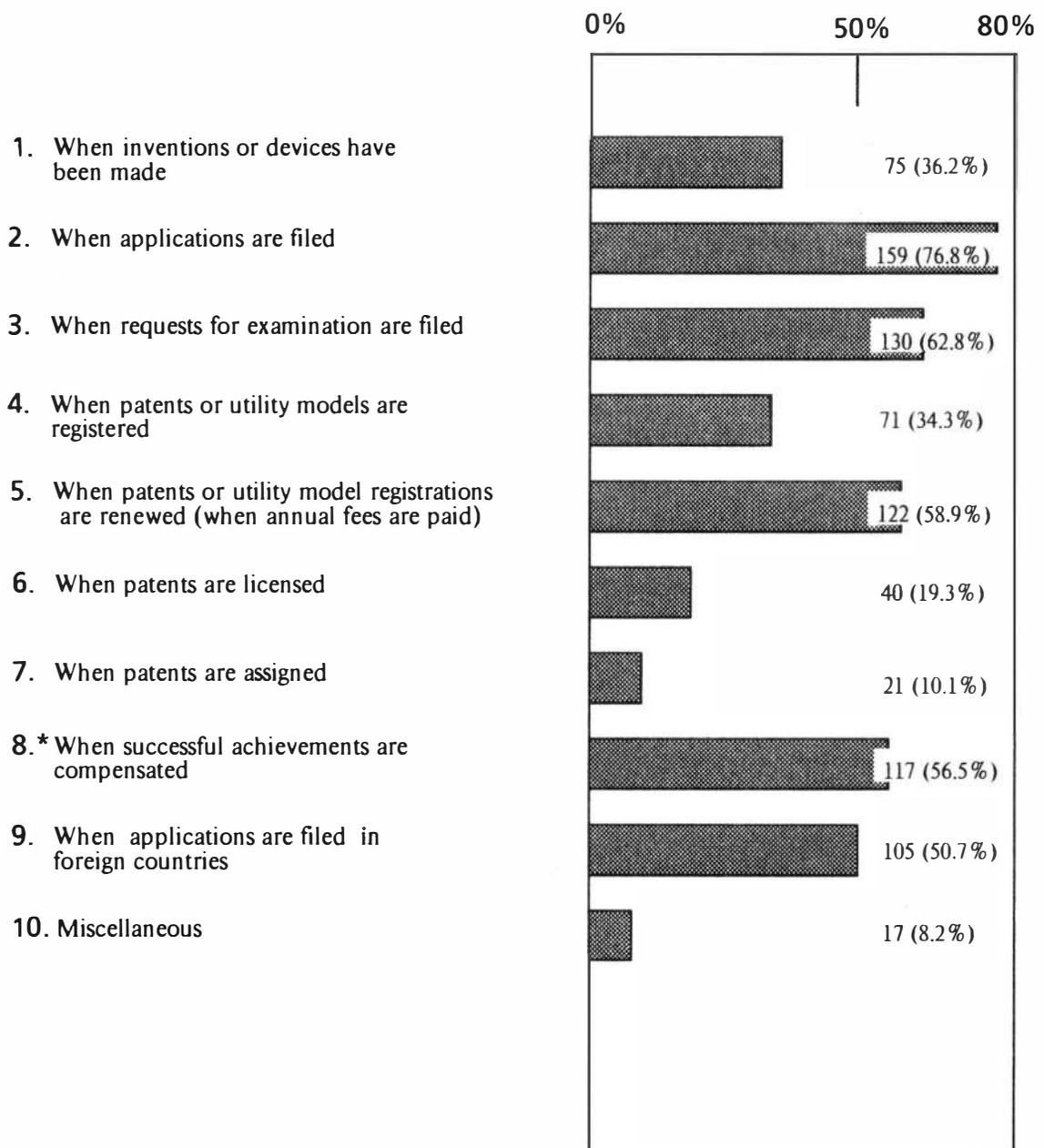
Note: Merit marks = { (1. very effective) x 2 + (2. effective) x 1 + (3. not effective) x 0 } / number of replying companies.

**Figure 5: Weight of Various Items in Evaluating
Inventions and Devices (Total)**

Evaluation Items		Marks
1.	Motives of inventions or devices	0.95
2.	Originality of inventions or devices (novelty and inventive step)	20.74
3.	Extent of monopoly of the right (scope covered by the right)	15.53
4.	Degree of effort made by inventors	0.97
5.	Job evaluation according to positions of inventors	0.29
6.	Correlation with technologies possessed by enterprises themselves	5.23
7.	Absence of alternative techniques	4.25
8.	Impact of invented technique	2.50
9.	Extent of utilization of conventional techniques	0.68
10.	Containment effect to others' techniques	8.33
11.	Degree of difficulty of related technical fields and problems to be solved	1.30
12.	Technical value obtained by working inventions	12.52
13.	Degree of difficulty of working invention (feasibility)	6.57
14.	Share of the right among analogous products	3.42
15.	Advertising effect	1.23
16.	Profit amount (ratio)	7.32
17.	Investment by enterprises (personnel and money)	0.90
18.	Lifetime of invented techniques	3.34
19.	Contribution to cost reduction	2.75
20.	Miscellaneous	1.18
Total		100.00

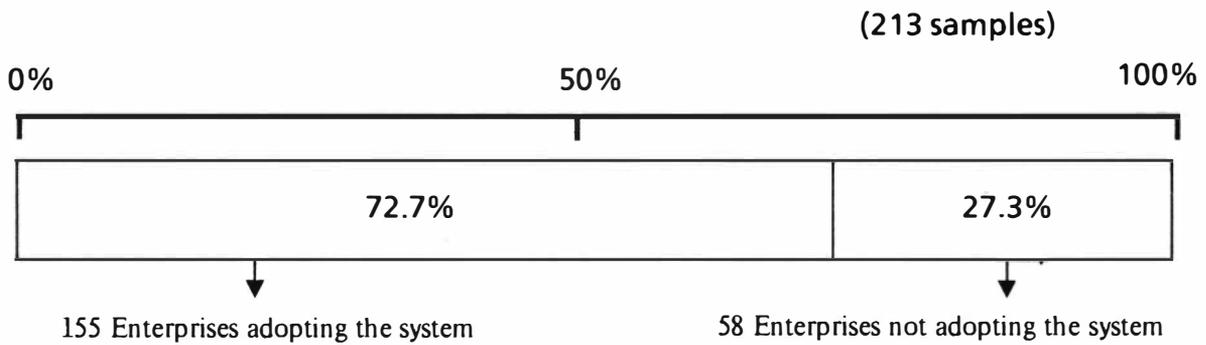
Figure 6: Occasions of Evaluating Employees' Inventions

(207 samples)



* When inventions are put into practice by the enterprises themselves.

Figure 7: Ratios of Enterprises Adopting and Not Adopting the Rewarding System



**Figure 8: Criteria for Rewarding Inventions,
Devices and Creations**

(153 samples)

(Enterprises)

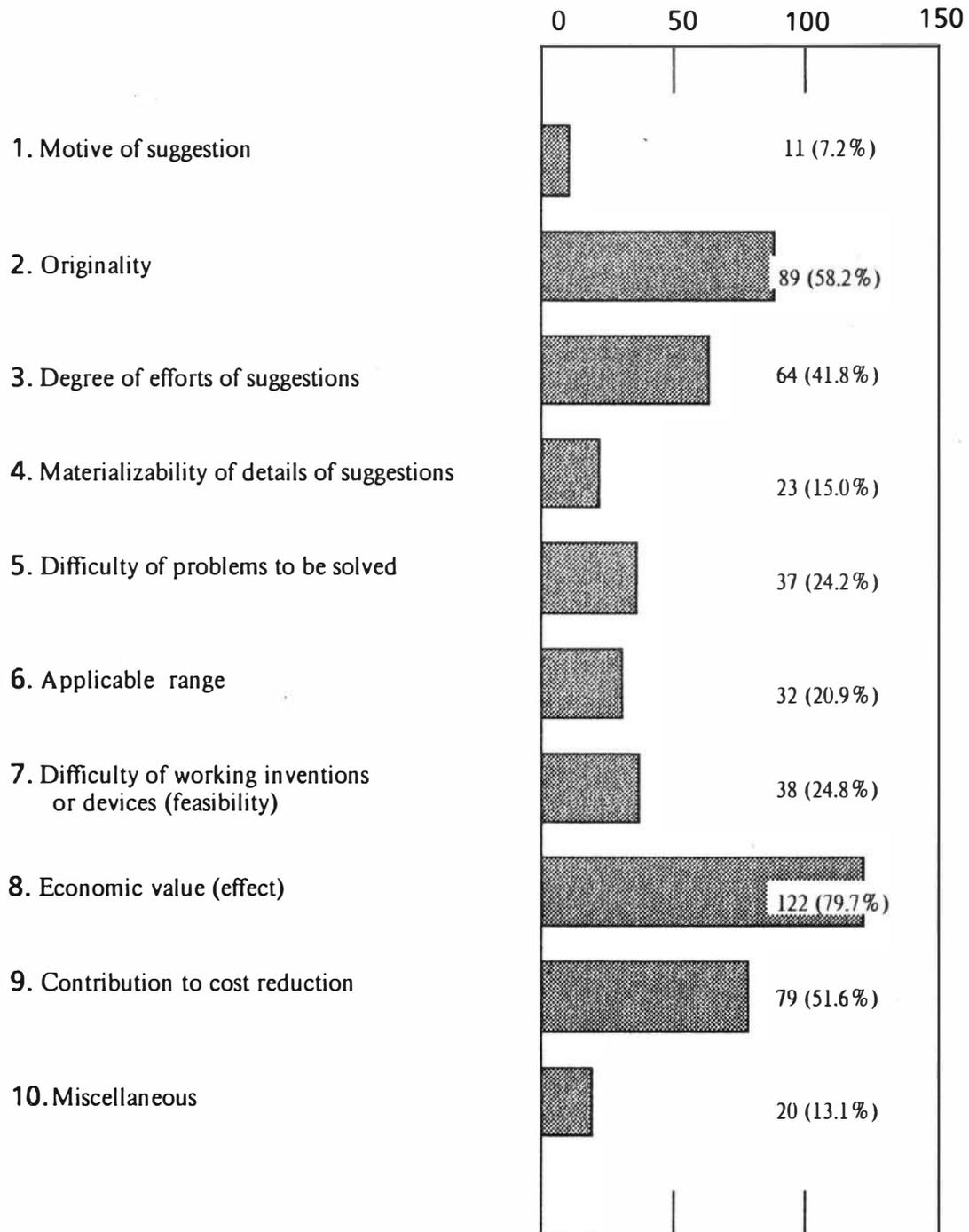
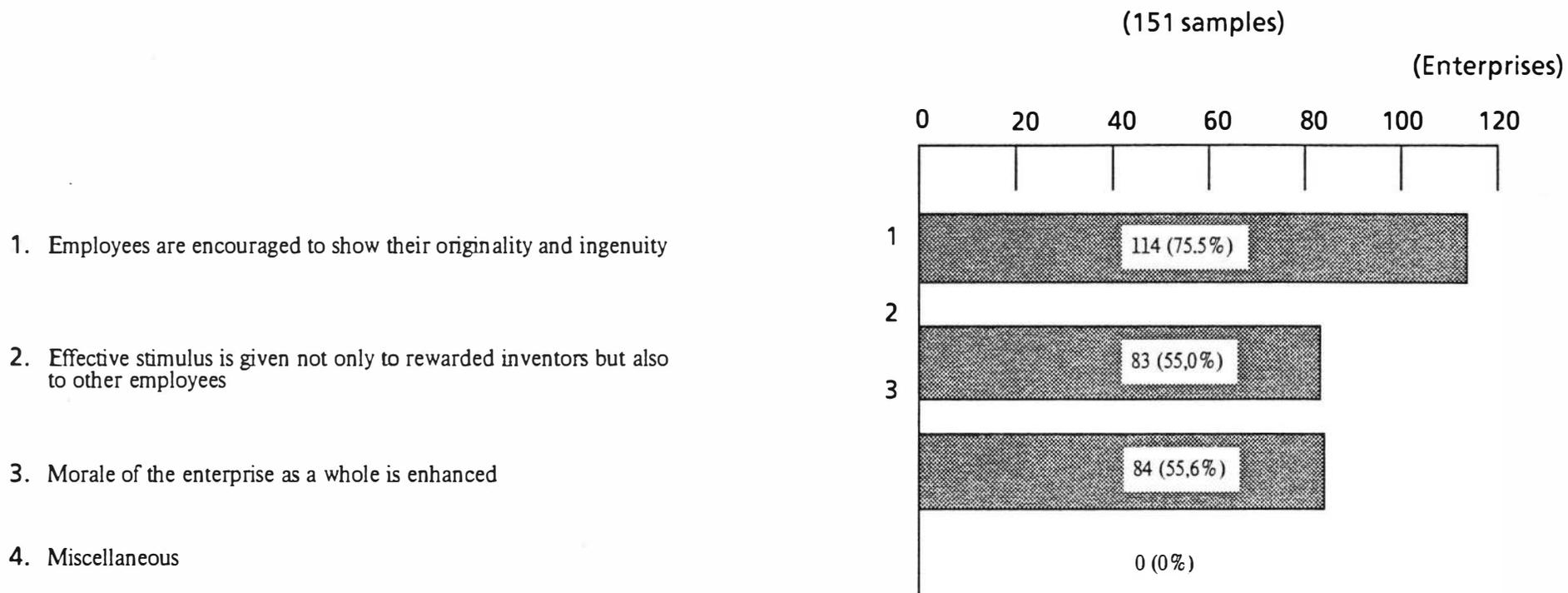


Figure 9: Effects of Adopting the Reward System

**Table 1: Divisions in Charge of Evaluation at Various Stages --
Case of Company A**

Time of evaluation	Divisions in charge
1. Inventing	Section chief having direct control over inventors
2. Filing Application	Chief of the division in charge of patent affairs
3. Requesting examination	Chief of the division responsible for patent affairs, inventors and section chief having direct control over inventors
4. Renewing or abandoning rights (paying annual fees)	Committee (chief of the division in charge of patent affairs, chief of the general affairs division, chief of the management division, chief of the accounting division, chief of the business division and executives in charge of technical affairs)
5. Licensing	Idem
6. Assigning	Idem
7. Compensating for achievement	Idem
8. Filing foreign application	Committee (chief of the division in charge of patent affairs, chief of the general affairs division, chief of the management division, chief of the accounting division, chief of the business executives in charge of technical affairs) and chief of the international division)
9. Miscellaneous	Idem

HOW TO ENCOURAGE INVENTORS
IN ENTERPRISES AND R & D CENTERS

CHINA'S STATE REWARDING SYSTEM FOR INVENTIONS

by

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Technology Commission,
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I. Through the ages, both China's Four Great Inventions and the successive invention of steam locomotives, electrical machinery, computers, etc., since the late 18th century in other countries have invariably demonstrated, by the drastic development they have brought to social productive forces, the tremendous role of technological inventions in boosting human civilization and progress. Since the end of the Second World War, many countries have witnessed a rapid growth of knowledge-intensive industries, and an expansion of the scope of commercialization of technology. The value of new technologies, especially "high technology," is becoming ever more incalculable. At the same time, various creative achievements of science and technology, including technological inventions, have turned into precious treasures for their owners.

In order to encourage technological inventions and safeguard their national interests, some economically developed countries began to give consideration to the protection of technological inventions in their own countries back in the 1850s. By the 20th century, a large number of countries had formulated laws, regulations and related administrative measures to encourage and protect inventions.

Since the founding of the People's Republic of China, the Chinese government, in order to encourage and protect the people's enthusiasm for making discoveries and inventions so as

to make science and technology better serve economic construction, has attached great importance to rewarding work on science and technology, and the earliest measure adopted was that of the State rewards for inventions. In 1950, the Administrative Council of the People's Republic of China promulgated the Decision on Rewards for Production-Related Inventions, Technical Innovations and Rationalization Proposals, and wrote into the Constitution of the People's Republic of China the "rewards for scientific and technological achievements, and technological discoveries and inventions." Thereafter, the Provisional Regulations on the Protection of Invention and Patent Rights, and the Provisional Regulations on Rewards for Production-Related Inventions, Technical Innovations and Rationalization Proposals were promulgated successively in the 1950s. In 1963, the People's Republic formally issued the Regulations on Rewards for Inventions, which further confirmed the system of State rewards for major technological inventions. In December 1978, the State Council revised and promulgated the Regulations on Rewards for Inventions of the People's Republic of China. Since then, the system of rewards for inventions in China has been developing in a sound way. Since the Patent Law of the People's Republic of China came into force in April 1985, we have had the formal coexistence of the invention reward system and the patent system. However, in a broader sense, they are both major policy measures adopted by the State for the purpose of promoting the development of creative power. If we have to differentiate between the two, we may point out the following main differences: the implementation of the patent system implies that the State will protect, through law, the legitimate rights and interests of patent holders and patentees including, for instance, their rights to production, use, sale and transfer so as to give play to the system's role in boosting the development of creative power. In comparison, the

basic feature of the invention reward system is to confer State honors and rewards on all inventors covered by the Regulations with the same ultimate goal of promoting the development of creative power.

Therefore, the two systems actually supplement each other as far as their functions are concerned. Practice over the past few years has shown that the invention reward system has a special role to play in both promoting the application of patented technology and encouraging discoveries and inventions beyond the scope of patents.

We believe that, in the course of building socialism with Chinese characteristics, the State reward system for inventions will continue to play an ever greater role in enhancing our creative power.

II. The invention reward system in China has the following features:

1. The principle of combining spiritual rewards with material rewards, with emphasis on the former

The State rewards for inventions include invention certificates, cash awards, medals and inventor's certificates, with all rewards given on the basis of reward-winning items. The State rewards for inventions are divided into five grades with the following amounts of cash awards: 1st award: 20,000 yuan; 2nd award: 10,000 yuan; 3rd award: 5,000 yuan; 4th award: 2,000 yuan; and a special award for especially great inventions upon the approval of the State Council with the sum of cash award to be specified accordingly. Cash awards,

invention medals and inventor's certificates are given to the individual inventors while the invention certificates are given to the units with which the inventors work.

2. Strict Standards of Rewards

According to the provisions of the Regulations on Rewards for Inventions of the People's Republic of China, the State gives invention rewards to new major achievements of science and technology that meet, at the same time, all of the following requirements:

- (1) Never achieved before
- (2) Advanced
- (3) Proved applicable in practice

Of the above-mentioned three requirements, the underlying principle is the promotion of application and diffusion of technological inventions in the hope of generating practical benefits for the country's development. The requirement of practicability, in particular, puts stress on being proved in practice so that it can both promote the early application of technological inventions and verify the practical value of these inventions. The requirement of being never achieved before emphasizes that all applications for invention rewards should have their originality checked, and it is further stipulated that unpublished technology with regard to its substance both at home and abroad may not be used as the basis to negate the originality of an application. This means that the principle determining originality is neither the one commonly referred to as "first application," nor entirely the one of "first invention," but the one of "first publicity" which aims at bringing inventions into the open and diffusing them.

3. Sound Evaluation Setup

Entrusted by the State Council, the State Science and Technology Commission has set up an Evaluation Committee of State Rewards for Inventions under its unified leadership. Under the Committee, there are a number of special evaluation groups based on different disciplines and fields of study. The Committee and the different special groups are composed of well-known Chinese experts and scholars, who are invited to assume the positions for a fixed term. At present, the total number of people on the Committee and in the special evaluation groups is maintained at about 500.

In addition, over 1,300 special examiners of State invention rewards have been invited to assist the Committee, through correspondence, in assessing the applications.

4. Thorough Evaluation Procedure

Any invention subject to reward evaluation should, in general, have a recommendation from the basic unit or a national academic institution, and be submitted to the office of the Evaluation Committee of State Rewards for Inventions after a formal examination by the competent department responsible for scientific and technological achievements at provincial or ministerial level.

The inventor applying for a State invention reward must fill in the necessary forms and present an application document. Before the invention is formally presented to the Evaluation Committee and the related special evaluation group, it should have the assessment comments of three to five specially invited examiners through correspondence.

In order to solicit extensively the opinions of domestic experts in the relevant fields, those items that conform with the requirements of formal examination will have their names and the names of the applicants published in the related journal regularly every year. There is a questioning period that lasts for three months from the date of publication during which any unit or individual may raise an objection in accordance with the relevant procedure. Whether an application can get a reward and the grade of reward is determined by secret ballot of all members of the relevant special evaluation group and the Evaluation Committee, subject to the final approval of the State Science and Technology Commission, which will give the reward.

III. Since 1979, the Evaluation Committee of State Rewards for Inventions has met 22 times and selected 1,344 technological inventions for rewards. Among them are one special award, 26 first awards, 140 second awards, 656 third awards, and 521 fourth awards. The implementation of the State invention reward system has played an important role in the following aspects:

1. A great number of inventors have been duly encouraged and the enthusiasm of the vast number of scientific and technological workers throughout the country has been vigorously enhanced. Between 1979, when the evaluation work of State invention rewards was comprehensively introduced in China, and 1984, the number of rewarded inventions has increased year by year while, at the same time, their academic and technological levels have been raised steadily. The annual number of rewarded inventions during the said period is as follows: 43 in 1979, 109 in 1980, 123 in 1981, 153 in 1982, 212 in 1983 and

264 in 1984. While the number of rewarded inventions has gradually increased, the number of inventors who have been rewarded several times has been on the rise.

All this shows that the establishment of the State invention reward system has not only raised the number of inventive achievements, but also played an active role in inspiring a vast number of inventors to constantly make new inventions.

2. A social environment of respect for knowledge and talent has been created. The State invention rewards, which confer great honor on the winners, also lend public recognition to the results of their labor, raising both their social status and fame in the relevant academic circles. Many rewarded inventors not only enjoy improved standards of living, but also find themselves selected as advanced workers or model workers at national, provincial, ministerial or local levels, or even promoted to leading posts.

3. The process of commercialization of technology has been stepped up. The publicity of each group of items winning State invention rewards has aroused great interest from the experts in the relevant fields through the country and in various enterprises. Many of them also command the attention of foreign colleagues. Since these reward-winning items have all undergone repeated assessments by experts, they undoubtedly enjoy higher credibility once they are publicized, thus giving a considerable boost to their commercialization process and drastically reducing the lead time from invention to production.

According to a survey of the items generating direct economic returns among the 1,344 rewarded inventions, the

application of these inventions to production has created a total value of more than 30 billion yuan.

Ladies and gentlemen, the above is a brief introduction to the State invention reward system in China.

HOW GOVERNMENT INSTITUTIONS AND INVENTORS ASSOCIATIONS
CAN MAKE BETTER KNOWN THE INTELLECTUAL PROPERTY
SYSTEM TO INVENTORS AND POTENTIAL INVENTORS

by

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It is for me a particular pleasure and at the same time the realization of a sincere wish to be allowed to report at today's Symposium on the Federal Republic of Germany's experience of State and private action for the encouragement of inventors. As President of the German Patent Office, I am all the more grateful for this opportunity since the administration that I head has long attached particular importance to cooperation with the Chinese Government and the Chinese Patent Office in the construction of an efficient system of industrial property in China. In this connection, it is interesting to note that experience in Germany has already provided a wealth of reference and guidance in overcoming the problems in China.

I. THE FUNDAMENTAL IMPORTANCE OF THE PATENT SYSTEM TO
ECONOMIC DEVELOPMENT AND TECHNICAL PROGRESS

1. It is in the natural interest of any authority, and therefore also in that of the German Patent Office of which I am the head, to provide the users of the patent system with the necessary information so that practical problems in the obtaining and asserting of industrial property rights do not arise at all, or at least can be solved in a rapid and unbureaucratic manner that is helpful to users. I am of the opinion, however, that any presentation of the information and intermediary function of a patent office in relation to innovation measures and industrial property will always be incomplete and inadequate unless, at the outset, some very basic consideration is given to the importance of the patent system to technical progress and economic development.

Above all, it must be clear that the tasks of patent offices cannot be considered in isolation from their functions, but that the inventor must remain at the center of the patent system. It then becomes readily understandable that all the individual activities and actions of patent offices must be judged on the inventor's expectation that the patent system should afford him adequate reward for his inventive achievements and the resultant enrichment of technology. It is therefore no more than logical that the activity of the patent office should not be perceived as mere registration or smoothly operating administration, but as an instrument to promote science and technology, to support the creative potential of the economy.

2. The fundamental leitmotiv in the grant of patent protection consists in the endeavor to assure the creators of advanced technology of adequate reward for their achievements for the benefit of the community. This is brought about by basically guaranteeing the inventor exclusive rights during the term of the patent, on the strength of which he retains control over his invention. Only he may normally determine what is done with his invention, whether, how and by whom it is applied and exploited in industry, and whether he uses it himself or authorizes one or more third parties to make use of it against payment of license royalties.

This means that the patentee has the right to proceed against any third party who uses his invention without permission, to prohibit acts of use and, where appropriate, to seek compensation for damages. It is thereby acknowledged that the results of creative technical work belong fundamentally to their authors.

Moreover, because material success is likely to be just as important and stimulating to the scientist or engineer or inventor as the certainly more exalted, immediate sense of achievement on making a scientific discovery or successfully reaching a functional technical solution, the fact of ensuring adequate rewards provides direct motivation to strive towards still more new technical discoveries and results.

Furthermore, the grant of legal protection counteracts the tendency to keep new technical developments secret in order to ensure de facto exclusiveness and thereby retain full control over the subject matter of the invention in order to take full advantage of personal achievements without interference. Thus the grant of the patent, in other words the reward given to the inventor, is at the same time the compensation for the disclosure of a new technical teaching, which will be freely available to the general public when the protection expires. Finally, the grant of exclusive rights limited in time fosters competition between scientists, engineers and inventors to continue producing new and better technical solutions, which in turn causes technology to progress.

3. By promoting technological progress in this way, the patent system at the same time emphasizes the outstanding importance of the creators of advanced technology for the economic development of a country. Scientists, engineers and inventors are the vehicles of technological progress on which the success of the economy is directly dependent. This is particularly applicable to countries like Japan and the Federal Republic of Germany which are short of raw materials and where the available technical creativeness is virtually the only raw material in practically unlimited supply. The same is also

true of the People's Republic of China which on account of its high population is forced, in spite of a wealth of natural resources, to harness the available technologically creative potential for the benefit of the economy and thereby for the common good. This can only succeed if every imaginable assistance and support is given to inventors as an incentive to continue their efforts in the construction of technical progress. This is the prime task of technical property rights, that is to say patents and utility models, which thus serve to promote technical progress in a number of different ways.

4. The importance of the technical intelligentsia, in other words inventors and researchers, to economic progress has also been convincingly demonstrated by economic and sociological studies. Projections have been made according to which, up to the end of the nineteen fifties, the growth of productivity in the United States of America relied in a proportion of 87%, and in the Federal Republic of Germany even 90%, on technical progress. Other studies have estimated the contribution of technical progress to the growth of labor productivity at about 75%.

5. At the same time, technical property rights are as a rule indispensable conditions for the translation of technical achievements and discoveries into competitive new products or processes. According to estimates made by our industry, expenditure on research and development represents 15 to 35% of the overall cost incurred in the design and development of a new product or process, from conception to market readiness. The balance of the expenditure, in other words between 65 and 85% of the overall cost, is necessary in order to develop the finished invention into a viable product or process and to introduce it onto the market.

The high level of financial risk involved in innovative processes can only be justified if there is a guarantee that, at least for a suitable period of time, it will be possible to operate exclusively on the market without the pressure of comparable products marketed by competitors who have saved research and development costs by imitating the finished product and are therefore able to offer lower prices.

Both patents and utility models therefore prove essential for the maintenance of the potential and competitiveness of firms of all sizes, and constitute an integral part of any entrepreneurial survival strategy.

II. PROVISIONS IN THE GERMAN PATENT LAW THAT PROMOTE INVENTIVE ACTIVITY

On the basis of these fundamental considerations, German patent law provides for the protection of the inventor by the grant of exclusive rights, limited in time, after thorough examination of the requirements for patentability, namely novelty, inventive step and industrial applicability. Certain provisions of the Patent Law have a particular bearing on the legal situation of the inventor.

1. Section 6 of the German Patent Law recognizes the principle of inventorship. It provides that the right to the patent belongs to the inventor or to his successor in title. The right to the invention is thus attributed in substantive legal terms to an individual person. Thereupon the right to the invention becomes the right to the patent by the filing of an application with the Patent Office.

Admittedly, this does not yet specify whether, and if so how, the Patent Office verifies the entitlement of the inventor in procedural terms. Implementation of the principle of inventorship without exception would make it necessary for the Patent Office to determine the inventor's entitlement in an official procedure. That would have resulted in the Patent Office carrying out tasks beyond its sphere of competence, namely the technical assessment of the invention for which a patent was sought; moreover, in practical terms, the work of the Office would have been made far more difficult. That is why Section 7(1) of the Patent Law provides that, in the proceedings before the Patent Office, the applicant is deemed to be entitled to request grant of the patent. The substantive examination of a patent application should not be delayed by the question of determining who is the inventor. The Patent Office merely requires the naming of the inventor or inventors (Patent Law, Section 37), the correctness of which is likewise not verified.

However, the Patent Law does not leave the inventor defenseless when his invention has been the subject of a patent application filed by a person not entitled to do so. He may assert his stronger rights in a number of ways. If a person not entitled to do so has filed an application in respect of his invention, he can sue the patent applicant before the ordinary courts of law and demand that the right to the grant of the patent be assigned to him (Patent Law, Section 8). Once the decision is final, the entitled person assumes the legal situation of the original applicant in dealings with the Patent Office.

The entitled party can, however, also proceed against the applicant by filing opposition based on usurpation (Patent Law,

Sections 7(1), 21(1)3) or an action for nullity (Patent Law, Sections 22(1), 21(1)3, 81(3)). An instance of usurpation is where the inventor has informed the applicant of the invention and the latter has filed an application without the inventor's consent, or where the applicant has come into possession of the documents describing the invention by unlawful means, such as theft.

If the patent is revoked by reasons of an opposition based on usurpation, the entitled person may himself file an application in respect of the invention and thereby claim the priority of the earlier patent (Patent Law, Section 7(2)).

The assignment to the inventor of entitlement to the patent ("principle of inventorship") has not always existed, however. Originally, the 1877 Patent Law applied the so-called "applicant principle" according to which entitlement to the grant of a patent belonged to the first person to file. That was at first a bitter disappointment for inventors and engineers. After prolonged discussions, it was not until 1936 that the corresponding provisions of the Patent Law were amended and the inventor principle was introduced.

2. In addition, the rights of the inventor in his invention are looked upon as non-pecuniary personal rights; the inventor is granted "moral rights of inventorship." The Patent Law protects the honor of the inventor by obliging the applicant, under Section 37(1), to name the inventor or inventors and to affirm that to his knowledge no other person has contributed to the invention. If the applicant fails to make the prescribed declaration within the assigned period, the application is rejected. The naming of the inventor to the Patent Office cannot be waived. The inventor's claim to being named as such thus establishes his moral right of inventorship.

The naming of the inventor to the Patent Office (Patent Law, Section 37) is the basis for all entries of the inventor's name on Patent Office documents, namely the published application, the patent specification and the publication of the grant of the patent in the Patent Journal (Patent Law, Section 63(1)). The inventor may request that he be not identified by name. He can thus exercise his moral rights in such a way that he does not make himself known to the public. If he renounces the stating of his name on the Patent Office documents, access to the document naming the inventor filed with the Patent Office is also restricted, and is granted only on receipt of proof of a legitimate interest. In that case, the name of the inventor cannot ordinarily be revealed even in a procedure for inspection of documents. The naming of the inventor in the patent specification is a fundamental principle for the social recognition of the creative achievement of the inventor. Except where there are special reasons in individual cases, the inventor will generally have an interest in his name being stated, so that interested members of the public may be enabled to attribute the creative, inventive achievement embodied in the invention to a particular creator.

3. These same principles also apply, in simply amended form, under the Law on Employee Inventions to inventions made during an employment relationship. According to that Law, the rights in such an invention belong also in principle to the inventor. In the case of service inventions (Law on Employee Inventions, Section 4(2)), however, the employer may claim transfer of the rights in the invention to him.

Any employee who has made a service invention must immediately announce and offer the invention in writing to his employer. The employer acquires the rights in the invention

only after he has informed the employee in writing within a specified period that he is claiming the invention. In that event, he is obliged to file a patent or utility model application in respect of the invention without delay (Law on Employee Inventions, Section 13). Should the employer fail to assert his claim to the rights, the invention remains the property of the employee, as a free invention, and he may file a patent application.

These provisions apply to all inventions made in the course of employment as part of the employee's duties within the firm or that have relied substantially on the experience or work of the firm.

The Law works on the assumption that the employer will systematically reserve for himself the rights in service inventions, but rewards the employee-inventor with a claim to appropriate remuneration. The employer has to pay the inventor that remuneration, its amount being determined by the economic value of the invention and the participation of the employee in its realization (Law on Employee Inventions, Sections 9 and 10).

Inventive activity is as it were automatically promoted by employee invention law because the employee has to announce and make available to his employer inventions made in the course of his employment, but is nevertheless rewarded for this with additional remuneration.

The employee-inventor receives the social and material recognition he deserves, while the firm is able to exploit to the full its innovative potential. Moreover, in order that the relationship of trust between the employee and the employer should be strained as little as possible, the Law provides that

any dispute over the amount of remuneration due to the inventor must be submitted to an Arbitration Board established within the German Patent Office. The competence, neutrality and experience of this Arbitration Board is acknowledged by all parties.

III. PATENT OFFICE MEASURES FOR THE ENCOURAGEMENT OF INVENTORS

Patent Office action should not be confined, however, to the smooth examination and grant of property rights in the course of a proper and lawful procedure. On the contrary, against the background of the growing significance of technical innovations for the development of our economy, the Patent Office has to increasingly assume the role of central intermediary for industrially applicable technological innovations by creating favorable conditions and facilities for technical information and by exploiting the information potential inherent in the patent system. The Patent Office fulfills this task by offering, in addition to its mandatory information duties under the Patent Law, a wide range of supplementary services, and presenting itself to inventors and to industry as a partner in the solving of their problems.

1. The most effective support that the Patent Office can provide, particularly to independent inventors and applicants in the important field of small and medium-sized businesses, is a rapid and reliable patent granting procedure. This type of applicant has particular need to know rapidly whether an invention is patentable. This information conditions the decision on whether an invention, after patent protection has been secured, should be developed further into a new product capable of asserting itself on the competitive market.

The German Patent Office offers national and now also foreign applicants particularly valuable assistance in the form of the examiner's first action before nine months have expired. In this way, the applicant receives, before the twelve-month priority period expires, an important basis on which to decide whether it is worth the great expense of filing European and foreign applications. This of course is contingent on the examination request being filed in good time.

The subsequent procedure should also be smooth and helpful to the user. Vigorous efforts have made it possible in recent years to reduce the duration of the procedure to below 30 months; a further reduction to below 24 months is my stated aim.

2. The Patent Office facilitates the inventor's access to the patent system and patent procedure by a multitude of leaflets, information brochures and other communications not required by law. This takes account of the fact that a creatively active inventor is not at the outset aware of the details and peculiarities of the rather complex procedure before the Patent Office, but concentrates on the development, testing and description of solutions to technical problems. In 1987, the information office specially set up in the German Patent Office gave written information in more than 18,000 cases and just as often advised applicants and inventors orally on the possibility of obtaining property rights.

The active counselling and support of inventors, who look upon the Patent Office as a reliable partner with whom to share their worries and problems, has also proved decisive when the eventual advice has been given to seek the assistance of a patent attorney. For in many cases inventors hesitate, out of

uncertainty or fear of excessive cost, to seek the professional advice of an attorney from the outset.

3. Free-of-charge counselling of inventors takes place at the Patent Office once a week in cooperation with the Bavarian Union of Patent Attorneys. In 1987, 400 inventors were thus given professional help in word and deed from experienced patent attorneys.

4. From my many conversations with individual inventors, patent attorneys and smaller businesses, I have discovered what extraordinary problems are involved not only in obtaining property rights but also in exploiting them commercially and asserting them in relations with competitors. It is not uncommon for individual inventors to invest not only their leisure time but also their entire savings in a technical development for which they have filed a patent application. It still happens far too often that disputes in the course of commercial exploitation or concerning the legal validity of a granted patent threaten their very existence, because the economic value of the property rights, and hence the cost of lawsuits, are often very high and in many cases the production of an entire business may be dependant on the exploitation of a specific patent. Not least, individual inventors and the small and medium-sized businesses want for support and backing when it is a question of preventing financially powerful competitors and large businesses from making unlawful use of property rights that have been applied for or granted.

In the 12 years of my term of office it has therefore always been my particular concern to understand as far as possible the individual worries, needs and problems of

inventors and applicants, and to apply the experience gained from contact with those applicants in the work of the Patent Office.

5. It will also be no surprise that a substantial aspect of the promotion of inventive activity has to consist in the provision of technical information. According to scientific investigations, up to 30% of research and development costs can be avoided by due consideration of accessible information. Assuming an outlay of public and private funds of more than 60 billion Deutschmarks a year for research and development in the Federal Republic of Germany, it follows that casual attitudes towards perfectly accessible technical knowledge cause a loss to the economy of up to 18 billion Deutschmarks a year, that being the amount literally squandered on superfluous duplication of development and repetition of inventions.

This basic situation is aggravated by the fact that scientists and technologists look on professional discussions with colleagues as their most important source of information, whereas patent documents as sources of information are mentioned in no better than twenty-first position. Furthermore, as other investigations have revealed that only about 5 to 10% of technology published in patent literature is at the same time also published in other specialist literature, the widespread tendency to neglect patent literature as a source of information is bound to lead to considerable gaps in knowledge.

The traditional Patent Office services in the field of technical information are, firstly, the publication of official Patent Office printed matter, that is to say the application documents and patent specifications, and, secondly, the supply

of information to the public on the procedural status and bibliographic data of applications and patents in the Patent Journal and Patent Register. In addition to the possibility of personally inspecting published patent documents in the consultation halls of the Patent Office or of having the required documents sent for a fee of 5.50 Deutschmarks, the inventor may also visit one of the 12 patent specification consultation centers in the Federal Republic of Germany, which the Patent Office keeps supplied with patent documents free of charge. Problems of cost, negligible in themselves, and also uncertainty as to competence are responsible for the fact that one or the other of these consultation centers is threatened with closure.

It is therefore not only essential for current technological development, but also a necessity for encouraging inventors, that the technical information should be taken to the user rather than to wait for him to appear.

Since June 1986, PATDPA, the German Patent Data Bank, which can be interrogated on line via the STN host, has offered the application and publication data of patent documents (published applications and specifications) issued by the German Patent Office since 1968, and also abstracts of documents issued by the Office since 1981. Data on European and PCT applications effective in the Federal Republic of Germany, and also drawings and other graphic material on the title pages of German patent documents (PatGraph), complete the range of services. At the end of 1987, PATDPA contained data on 1,368,000 German patent applications, 90,000 utility model applications and 225,000 European applications effective in the Federal Republic of Germany.

The Patent Register has also been open to on-line consultation since 1981; it likewise contains the abstracts of patent documents issued since 1981.

An important consideration in the design and development of the Patent Office's on-line information service is the fact that individual inventors and small and medium-sized businesses in particular are reliant on improved access to technical information, while major firms to a large extent can refer to their own classified documentation.

6. However, the German Patent Office's on-line information service also deals with the aspect of working of inventions. The RALF on-line licensing data bank contains data on property rights that have been funded by the Federal Ministry for Research and Technology or in respect of which licensing declarations have been filed.

These are, to begin with, the declarations of willingness to license under Section 23 of the Patent Law, whereby the patentee irrevocably commits himself to allow any person to make use of his invention in return for reasonable compensation. A serious drawback of the declaration of willingness to license is the fact that the issue of exclusive licenses is not possible and that the willingness to license, once declared, is irrevocable, so that the working of the invention is often not facilitated, but on the contrary hampered. Therefore the German Patent Office now accepts non-binding declarations of interest in licensing, whereby the owner of the property rights, without in any way committing himself legally, announces his interest in the grant of licenses.

Anyone can make a simple and uncomplicated on-line enquiry as to the availability of property rights for licensing in a given area of technology according to the International Patent Classification (IPC). In this way the licensing market becomes more transparent, in particular for small and medium-sized businesses, and the prospects for the working of property rights are enhanced.

At present, RALF is the only licensing data bank in the world offered by a patent office.

7. Economic and moral recognition of the inventor are complementary. A technology-orientated country like the Federal Republic of Germany has every reason to be grateful to its outstanding inventors for their contributions to the country's economic development. That was why in September 1984, I inaugurated the German Inventors' Gallery at the German Patent Office, which was subsequently repeated, in 1987, on the occasion of the celebration of the 110th anniversary of the German Patent Office. The aim of the gallery of portraits of important German inventors is to show how significant areas of modern and progressive technology received decisive impetus from the Federal Republic of Germany. The honor of being included in the Inventors' Gallery has so far gone to such noted inventors as Professor Hermann Oberth, Professor Felix Wankel, Professor Bruch, Bela Barenyi, Dr. Rudolf Hell and Professor Ernst Ruska.

IV. PROMOTION OF INNOVATION BY PRIVATE AND PUBLIC BODIES

These efforts by the German Patent Office to contribute to the material and social recognition of the inventor in

highly different subject areas and centers of activity are nevertheless a small example from the vast number of areas of research and fields of work of various institutions that have set themselves the task of promoting inventive and innovative activity.

1. On the assumption that inventive activity is the only raw material that is still available in unlimited quantities in our industrialized countries, the "German Action Group for Education, Invention and Innovation" (Deutsche Aktionsgemeinschaft Bildung--Erfindung--Innovation, or DABEI) was founded at my instigation in 1982, in order to promote education, research and innovation with the specific aim of ensuring our economic competitiveness. At the time, it was very important to the founders of DABEI that they should, at the same time and in agreement with each other, institute measures in the fields of education and research, invention and innovation that would strengthen the willingness of firms to innovate, increase the effectiveness of innovation-related research and technical creativeness on the part of scientists and engineers, and remove the obstacles to innovation in the public awareness.

The aims and focal areas of the Group are the following:

- promotion of creativeness by education and training;
- promotion of inventions and innovations;
- improvement of technical information and the use of the patent system, and
- analysis of obstacles to innovation.

It will increasingly be important to recognize inventive achievement and facilitate the implementation and exploitation of innovation measures.

The model for DABEI was the Japan Institute of Invention and Innovation (JIII), which under the patronage of the Tenno has been successfully promoting inventive activity since 1904, helping to improve the quality of Japanese technology and contributing to a climate conducive to innovation in industry and society. However, JIII has operated under incomparably better conditions: while DABEI is a purely private venture, JIII works with 250 full-time staff and a budget of about 160 million Deutschmarks, can rely on active support from 13,000 members and offers its services in 47 branches. The promotion of inventive activities in Japan has always been an example to Germany.

There are a number of inventors' associations in the Federal Republic, but between them they have only about 1,200 members. Alongside the Society for the Promotion of Inventive Activity in the Federal Republic of Germany (GFEW), which is also a member of the International Federation of Inventors Associations (IFIA), the interests of inventors, researchers and owners of rights are represented by the German Inventors Association (DEV) and the German Inventors Guild (DER).

3. The Patent Center for German Research, which is affiliated to the Fraunhofer Society, is responsible for helping researchers and independent inventors with the working of economically promising inventions. To that end, loans can be obtained for the filing of patent applications both within the country and abroad. The Patent Center gives inventors advisory assistance with the technical aspects of patent working and the selection of potential licensees, and helps the inventors in license negotiations.

4. The Chambers of Industry and Trade provide direct assistance in the working of inventions through their information services "Cooperation Exchange" and "Technology Exchange," in which patented products are offered or requested, and in which partners for marketing, development and sales are sought.

5. Other institutions, like the Inventors Center of Northern Germany (EZN) or the East Bavarian Technology Transfer Institute (OTTI), promote innovation action by means of advisory services and financial assistance, work out patent protection strategies, help with commercialization and marketing and follow innovative projects from the original idea up to market readiness. It is gratifying that there has recently been an increase in the number of institutions in Germany concerned with the encouragement of inventors.

6. Finally a mention should be made of the numerous awards for inventors and scientists, on the selection panels of which I have often served in my capacity as President of the German Patent Office.

The "Diesel Medal," in the creation of which the son of the great German inventor Rudolf Diesel was involved, is awarded by the German Institute for Invention every two years to outstanding inventors both in Germany and abroad.

The "Artur-Fischer-DABEI-Preis" created by the noted German inventor Artur Fischer, serves for the promotion and public recognition of inventions and technical innovations that improve the quality of life for man and society.

The Phillip Morris research prize "Challenge of the Future" was created in 1983 in order to encourage researchers and inventors to solve the manifold problems of our time with creativeness and optimism and to work towards the broad acceptance of technology. The prize is awarded annually by the Phillip Morris Foundation, under the patronage of DABEI. The research prize is intended to highlight outstanding innovative achievements in the fields of man and the environment, materials and processes, information and communication and transport and traffic.

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In the course of its 111-year history, the patent system in Germany has repeatedly demonstrated its role as the crystallization point for technical, economic and social change. The encouragement of inventors and the promotion of inventive activity is therefore, for me, not only a special duty but also a fascinating challenge.

HOW GOVERNMENT INSTITUTIONS AND INVENTORS ASSOCIATIONS
CAN MAKE BETTER KNOWN THE INTELLECTUAL PROPERTY
SYSTEM TO INVENTORS AND POTENTIAL INVENTORS

IMPLEMENTING THE PATENT SYSTEM
AND PROMOTING INVENTIVE AND CREATIVE ACTIVITIES

by

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It gives me great pleasure to be here with you attending this Symposium, which, co-sponsored by WIPO and IFIA, is the first of its kind ever held in China. I feel also much honoured to have an opportunity to speak on the relation between the patent system and the inventive and creative activities in the light of the practice and experience of over three years of implementing the Chinese Patent Law. The title of my presentation is: "Implementing the Patent System and Promoting Inventive and Creative Activities."

I.

The Patent Law of the People's Republic of China was promulgated on March 1, 1984, and entered into force on April 1, 1985. The establishment of the patent system in China is the logical outcome of the policy of reform and opening to the outside world in China's new era, while the implementation of the patent system has in turn promoted the development of this policy. The implementation of the Patent Law also shows the great emphasis that the Chinese Government has always laid on the inventive and creative activities.

As stipulated in Article 1 of the Chinese Patent Law, "This law is enacted to protect patent rights for inventions-creations, to encourage inventions-creations, to foster the

spreading and application of inventions-creations, and to promote the development of science and technology, for meeting the needs of the construction of socialist modernization."

This indicates in explicit terms that one of the fundamental purposes in enforcing the Chinese Patent Law is to promote the inventive and creative activities. This purpose runs through and is embodied in other articles of the Law and its Implementing Regulations, for example in the provisions on the right of the inventor to file an application for a patent for a non-service invention, on the rewards and remunerations awarded to the inventor of a service invention, on the naming of the inventor, and on the definition of the co-inventors, etc.

The leaders of the Chinese Government have all along attached great importance to the inventive and creative activities and affirmed the positive role of the Patent Law in promoting inventive and creative activities. When speaking on the 7th Five-Year Plan, Comrade Zhao Zhiyang, Secretary General of the Communist Party of China, pointed out: "We must execute the Patent Law conscientiously, protect the rights of inventors and further arouse the enthusiasm of the scientific and technical personnel and broad masses of the workers in making inventions and creations." Premier Li Peng also stressed in a speech at the First Session of the Seventh National People's Congress: "We must earnestly execute the Patent Law and encourage and promote inventions and creations, and unfold a mass movement of technological innovation among the scientific and technical personnel and broad masses of the workers extensively and intensively."

It is clear from what has been described above that one of the fundamental purposes of enacting and executing the

Patent Law is to arouse the enthusiasm of the broad masses of the people in our country to make inventions and creations, and to encourage and promote inventive and creative activities. This was the guiding principle that we kept in mind when we started to establish the patent system and we have adhered to it all along in the course of executing the Patent Law.

II.

Practice over the past three years has shown that implementation of the patent system has effectively contributed and is contributing to the promotion of the inventive and creative activities.

I would like first to offer you some relevant figures. By the end of June 1988, the Chinese Patent Office had received altogether 75,258 patent applications, of which 58,579 applications were filed by domestic applicants, which accounts for 77.8% of the total. Among these domestic applications, there are 20,640 applications for service inventions-creations, making up 35.2% of the total, and 37,939 applications for non-service inventions-creations, making up 64.8% of the total. Since April 1, 1985, when the Patent Law entered into force, the number of domestic patent applications for non-service inventions-creations has kept increasing. Specifically, in 1985 altogether 5,078 applications were filed, accounting for 54% of the total: 8,945 applications were filed in 1986, accounting for 65.4% and the figure rose to 14,315 in 1987, accounting for 66.1% of the total. Up to the end of June this year, the Chinese Patent Office has granted a total of 14,147 patents.

Having mentioned this, I would like to proceed with some more detailed information.

1. You may be interested to know the way China has tried to protect the patent rights of the inventors.

The execution of the Chinese Patent Law furnishes a legal and definite protection to the invention-creation of the inventor, thus defends his legitimate rights and interests.

The patentee's rights as provided for in the Chinese Patent Law include the exclusive right to exploit the patented invention-creation. The Law stipulates that the patented invention-creation is intangible property which belongs to the patentee exclusively, and no entity or individual may, without the authorization of the patentee, make, use, or sell the patented product, or use the patented process, for production or business purposes, and that any entity or individual exploiting the patent of another must conclude with the patentee a written licence contract and pay the patentee a fee for the exploitation of the patent.

The patentee's rights also include the right to put an indication on the patented products. As is prescribed in the Law, "the patentee has the right to affix a patent marking and to indicate the number of the patent on the patented product or on the packing of that product."

The Chinese Patent Law defines clearly the patent infringement and the remedial measures for such infringement. For any exploitation of the patent, without the authorization of the patentee, thus constituting an act of infringement, the patentee or any interested party may request the administrative authority for patent affairs to handle the matter or may

directly institute legal proceedings in the people's court. The said administrative authority has the power to order the infringer in question to stop the infringing act and to compensate for the damage caused by the infringement. Any party dissatisfied with the decision of said authority may, within three months after the receipt of the notification, institute legal proceedings in the people's court. If such proceedings are not instituted within the time limit and if the order is not complied with, the said administrative authority may approach the people's court for compulsory execution. From these you can see that the protection afforded by the law to the patentee is adequate. We are very earnest with the enforcement of the Patent Law. Here is a case.

A factory in Henan Province developed a new product known as New Honeycomb Briquet-Making Device, which was patented in 1987. Later it was found that as many as 46 factories, without the authorization of the patentee, had manufactured and marketed the said product. This, of course, constituted an infringement of the exclusive right of the patentee. The patentee, according to the Law, justifiably requested the competent provincial administrative authority for patent affairs to deal with the case. The authority, pursuant to the provisions of the Law, ordered the 46 infringing factories to stop their acts of infringement, and to pay the patentee a sum totalling 90,000 Yuan as compensation.

2. Assistance has been extended to inventors in exploiting the patented technology.

In close cooperation with the pertinent departments in our country, the Chinese Patent Office and the administrative authorities for patent affairs tried to extend various kinds of assistance to inventors, especially the individual inventors,

in exploiting their patented technologies. We have offered to recommend patented technologies with good promises of commercialization, to appropriate manufacturers, through the conclusion of patent licensing or assigning agreements, so that these potentially marketable technologies can be exploited as soon as possible. To this end, the Chinese Patent Office and its branch office organized a number of patented technology exhibitions, fairs and press conferences to disseminate related information.

It often happens that many patented technologies need to be further developed or applied to experimental production before they are commercialized. Generally, it is difficult for the individual inventor to do so. To meet this need, the interested administrative and financial authorities are actively setting up pilots plants or institutes for the development of patented technologies, which may assist the individual inventors to further develop and commercialize their patented technology. So far bases of this nature have been set up in Beijing, Shanghai, Hebei, Zhejiang and Hunan.

Moreover, with the support of the departments concerned, efforts were also made to establish various kinds of patent funds to help inventors, especially individual inventors, to overcome fund shortages that hindered them from applying for patent right or developing and exploiting the patented technologies. For example, there is a fund, jointly set up by the Ministry of Foreign Economic Relations and Trade, the China Council for the Promotion of International Trade and the Patent Office, to lend foreign exchange to individual inventors for the purpose of filing patent applications in foreign countries. In addition, six funds are set up by science and technology commissions and administrative authorities for patent affairs at various level across the country to finance individual inventors to file applications for patents or exploit their

patented technologies. Meanwhile various funds are also set up by individual inventors themselves with contributions out of their gains whereby to facilitate exploitation of patented technologies.

As to patented technologies of major importance to the development of the national economy, the Chinese Patent Office and various administrative authorities for patent affairs take prompt actions to recommend them to the departments concerned, which will, on the basis of their merits, enter them in the national or regional development plans. In this situation, the central government will take it on itself to make efforts to exploit these items and pay the patentees a fee pursuant to the provisions of the Patent Law. Some patented technologies have been given priority for exploitation in the national plan of technological reform, while others will be exploited as priority items under the Sparks Program initiated by the State Science and Technology Commission.

Thanks to the close attention given by the government and with the support of the various departments, the percentage of exploited patented technologies is high. According to a random sampling survey, generally it could reach 30%, and in certain areas, it reached as high as 50%.

3. Various services have been offered to inventors.

In some of the departments within the Chinese Patent Office, a free service system has been established to offer advice and consultancy on legal matters or documentation to inventors from all over the country. For example, the Legal Affairs Department alone receives some 1,000 visitors and responds to as many as over 800 enquiries annually. In addition, the Office also provides patent documentation

retrieval services to scientific and technical personnel. To this end, a patent documentation service centre, open to the public, is established in Beijing. In the meantime, 65 Office-affiliated Chinese patent documentation service centres have been set up all over the country, which provide easy access for inventors. At those centers, scientists and technicians may make searches of documentation by themselves, or they can request those centers to do the search for them. Translation of patent documents and some other services are also provided in those centers. It is estimated that the Patent Documentation Service Centre in Beijing receives as many as 10,000 visitors a year.

All this shows that the administrative authorities for patent affairs and patent agencies make a point of offering whole hearted services to scientific and technical personnel to facilitate their inventive and creative activities. No wonder some of them heap praise on the Centre for its good work and endearly call it "the Home of the Inventors."

III.

We are fully aware that the patent system is not widely known in China as yet since the establishment of the patent system in a recent development. Therefore a great deal of publicity work remains to be done on a prolonged and sustained basis. Once the broad masses of the people, especially inventors, are well acquainted with the significance of the patent system, they will be in a better position to make use of it and protect their own lawful rights and interests. Only thus can the patent system be welcomed and supported by the broad masses of people.

For this purpose, we have done some work in the following areas:

1. Efforts have been made to disseminate the knowledge of patents by various means. Specifically, we did everything we could to publicize the Patent Law and popularize the knowledge of patents. According to incomplete statistics, from April 1, 1985, to the end of 1986, over 200 newspapers and periodicals at both national and provincial levels carried articles on the subject of patent. In addition, the Patent Office took it upon itself to edit and publish books and periodicals on patents. It was estimated that during the period from 1985 to 1986, a total of over 300,000 copies of books, 48 issues of the Patent Review of China and the Review of World Invention, and 130 issues of other periodicals for internal circulation were published and distributed by the Patent Office.

What is more, from April 1, 1985, to the end of 1986, as many as 195 seminars and training courses on subjects related to patent or patent documentation had been sponsored by various localities and departments with the support of the Patent Office and the administrative authorities for patent affairs, with a total participation of over 20,000 people.

2. Work on patent has been strengthened in enterprises.

In 1987, the Chinese Patent Office, the State Economic Commission, the State Science and Technology Commission and the Ministry of Finance, jointly issued a circular entitled "Regulations on the Strengthening of the Patent Work in Enterprises." This important document was designed primarily to enhance the patent management system in enterprises. It sets specific requirements for the strengthening of the patent work in industrial sector, taking into account the realities

prevailing in enterprises. With this in mind, efforts were made to bring together enterprises to share experience in ways and means of strengthening the patent work in businesses. Specifically, in 1987, the Patent Office entrusted the Institute of Advanced Patent Training to run 10 training courses catering to the special needs of enterprises. These training courses were attended by people from 800 different enterprises scattered all over the country. As a result, as many as 1,360 trainees had completed their courses with a course certificate which qualified them for what we call the "backbone force" in promoting inventive and creative activities and the patent work in industrial enterprises. The 1987 statistics showed that as many as 3,078 applications were filed by enterprises, a 53.4% increase compared with the number of 1986.

3. Great attention has been paid to strengthen the patent agencies.

By the end of 1987, there were a total of 4,500 registered patent agents who had passed qualifying examinations. Meanwhile nearly 400 patent agencies had been functioning, of which four were designated as foreign-related patent agencies. According to the 1987 figure, the patent agencies had handled a sum-total of 13,174 applications within China on behalf of inventors, accounting for 61% of the total applications processed. Indeed, patent agencies have contributed their share to the implementation of the patent system and have proven instrumental in serving the needs of inventors.

China used to be the country of origin of the well known "Four Great Inventions" and had made great contributions to the development of the civilization of mankind. In a new era of world technical revolution, certainly there will be more and more inventors in China to participate in the making of the

modern civilization of mankind. As a famous saying goes by Abraham Lincoln, former President of the United States of America, "The patent system added the fuel of interest to the fire of genius," the Chinese patent system, under the care and support of the Chinese Government and people, and with the close cooperation between and joint efforts of the departments concerned (including the fruitful efforts of the China Association of Inventions), has as a matter of fact added a large amount of "fuel of interest" to "the fire of genius" of the vast number of inventors in China. It will surely result in the further promotion of the inventive and creative activities in China and, consequently, make contributions to the socialist modernization program of China and the progress of mankind.

HOW TO CREATE A FAVORABLE ENVIRONMENT
FOR INVENTIVENESS, PARTICULARLY IN RURAL AREAS

by

Mrs. Magdalena Villaruz,
President, Women Inventors Association
of the Philippines (WIAPI)
and President
SV Agro-Industries Enterprises, Inc.

When I received the invitation to be one of the key-note speakers on one of the five topics of this symposium on Creativity and the Promotion of Inventive Activities, viz. "How to create a favorable environment for inventiveness, particularly in rural areas," I was rather hesitant to accept the invitation for I might not be able to impart to you your expectations on this topic, but nevertheless, it is indeed an honor and a great opportunity to be a part of this international symposium and it is good to be back again in your country, after so many years, this time to share with you the experiences of Filipino inventors, both men and women, those (like me) living in rural areas.

It cannot be denied that so many things around us, necessary items, the products that we see and use daily, things that we take for granted from a simple gadget to the discovery of the wonder medicine to a highly sophisticated technology and so many amazing and wonderful things that make life easy, impossible things made possible are contributions of so many single individuals: the inventors, the scientists, whose lives and achievements, imagination and ingenuity have brought us into the technological age of today. Some worked in well-equipped laboratories; some with limited resources and some concentrated on a single item; they did not think about awards, recognition or fame; what then was the favorable environment for their inventiveness, what inspired them! It would be a long story.

Today, I just would like to share with you the experiences of Filipino inventors, their frustrations and inspirations for creating a favorable environment for inventiveness in rural areas.

Inventors, whether Filipino or otherwise, are gifted with a highly skilled and creative vision. Having received this gift from God, they play an important role in the economic development of their country and the world as a whole. They are gifted with insight, i.e. a keen sense of perception, which provides the necessary vehicle through innovative ideas of what technology is needed and appropriate for industrialization and strive to invent things useful for their country, but an invention is nothing, no matter how useful it is to mankind, if that invention dies with the inventor--and if that invention is not disclosed and utilized.

Questions such as:

1. How can our inventions be made widely known and put to use by mankind?
2. Since the inventions in a sense are the result of the pains and efforts of inventors, how can these be protected?
3. How can we encourage more and still better inventions?

are some of the questions commonly asked. How does one disclose and utilize these inventions? One way is by obtaining a patent protection, but how strong is our patent system? Does it really give protection to the intellectual property of an inventor? By disclosure and utilization of his inventions, he

enhances investments and commercialization which, in turn, contributes to the speeding up of industrial development of one's country. However, the majority of inventions originate from the industrially developed countries and are intended to provide solutions to highly technical problems that we, the third world or developing countries, make or use little of. Thus, their use will be altogether impossible or possible only after substantial adaptation or innovation corresponding to their environment. It is rather more rational to "produce the inventions" directly within the country and should ideally occur where the need is felt. The appropriate mixture of home-grown inventions and/or technologies and suitable imported technologies will boost economic growth, but to encourage home-grown inventions, there is a need of a system for stimulating, implementing, promoting and rewarding new ideas.

Some factors that will create a favorable environment for inventiveness:

- political, educational and cultural
- science and technology
- institutionalized infrastructures
- resources, both natural and man-made, as men, money and materials
- external linkages

must be existing if inventions and inventors are to prosper and become meaningfully significant.

As politics initiate policies and decisions for development, through legislative enactments, so it is the government which should provide the leadership and network--vertical and horizontal--so that implementing actions,

funding and operations of the institutional infrastructures can be achieved. In the Philippines, this is mandated by the 1986 Constitution, Article XIV sections 10 to 13, the essence of which is that science and technology are essential for national development and progress. The State shall give priority to research and development, invention, innovation, and their utilization, and to science and technology education, training and services. It shall support indigenous, appropriate, and self-reliant, scientific and technological capabilities, and their application to the country's productive systems and national life. The Congress may provide for incentives, including tax deductions, to encourage private participation in the program of basic and applied scientific research. Scholarships, grants-in-aid, or other forms of incentives shall be provided to deserving science students, researchers, scientists, inventors, technologists, and specially gifted citizens. The State shall regulate the transfer and promote the adaptation of technology from all sources for the national benefits, of private groups, local governments, and community-based organizations in the generation and utilization of science and technology. The State shall protect and secure the exclusive rights of scientists, inventors, artists and other gifted citizens to their intellectual property and creations, particularly when beneficial to the people, for such period as may be provided by law.

The support and assistance of the Department of Science and Technology regional offices is being tapped by local inventors and other local research institutions which have technical experts; the use of laboratory and fabrication facilities, and the research and development information system, is also available to our local inventors.

The recent "Buy-Philippine made product", as the thrust of the government and the private sector, will greatly stimulate not only the inventiveness but also product development awareness of Filipinos; this is one economic factor that will enhance inventiveness in rural areas.

Following the tenet: "Everyone is a potential inventor," we, in the Philippines, have a potential of 58 million inventors, needing the proper environment or climate to stimulate inventiveness; of course, we have international organizations, specialising in agricultural machinery, such as RNAM, AMDP of the Philippines, and many others.

Filipino inventions, to date, are competing with imported technologies resulting in savings of millions of dollars in import expenditures. Filipino inventions have attained a certain degree of prestige, some of which have already found their way into the world market.

International organizations like the World Intellectual Property Organization (WIPO), a UN specialized agency, and the International Federation of Inventors' Associations (IFIA), have provided external linkages for Filipino inventors as paper presenter or resource speakers, or to conduct seminars or workshops. A recent one was on Asian Women's Technology Transfer Workshop on Food Processing and Herbal Technology organized by Approtech Asia and the Women Inventors Association of the Philippines, Inc., (WIAPI). Local inventors society also provide the form for fruitful exchange of ideas among inventors, yet it is sad to say that we, Filipino inventors, are not cohesive; we are divided among ourselves because we are not given a strong science and technology policy, inadequate budgetary support, lack of effective R & D management, not

enough incentives for us to invent better things, we are afraid to bring to the open our new inventions for fear of being copied by others and to be improved by international institutions within our country while our patents are still in existence. We still have that colonial mentality that imported technology is better than a locally developed one. I don't want to portray to you a bleak picture of Filipino inventors and, after interviewing several inventors--both men and women--whose actual contribution to the economic recovery of my country and success story for survival are worth mentioning here, inventors such as Margie Centeno, Pia Tolentino, Olympia Gonzales, Rose Cirera, Alfredo Anos Sr., Isidro Bonifacio, Carlita Duran, Mila Ramos, Ming Modanza, and many more whose names would take more space than this write-up, share the common problems and heartaches of lack of working capital, patent protection, shortage of raw materials, insufficient incentives, multinational corporation competition but, again, they were able to invent things because of their environment, out of boredom and necessity. In spite of our incohesiveness, (there are now three Filipino Inventor Societies and one Women Inventor Association of the Philippines 'WIAPI'), hopefully, we, inventors, hope to evolve in a strong, cohesive group in the best interest of our members and country. In Region VI, the Western Visayas (where I come from), we have an association known as I-ACT (Ilonggo Association of Creative Thinkers) and we hold our meetings at the office of the Department of Science and Technology; we have been asked to sit as members in the Regional Economic Development Council under the sub-committee of Science, Technology and Productivity.

Just let me share with you the unfavorable situation that resulted in the "Creation of a Favorable Environment for

Inventiveness particularly in Rural Areas", focusing on:

1. How the design was conceived?
2. Obstacles encountered
3. Commercialization of this invention
4. Influence of patent law
5. Incentives

Millions of farmers in South-east Asia and other parts of the world know from experience that the preparation of their muddy watersoaked ricefields is a hard job. Not only for the farmers themselves, but also for their waterbuffallos and, when mechanization is applied, for the power tillers.

It frequently happens that the soft-mud later becomes so deep that the tillage of the soil turns into a near hopeless task for men, animals and machine. The time, human energy, animal energy, mechanical energy and expenses required for the preparation of one hectare of wet-riceland are extremely high and seriously affect not only the costs of production, but also the income and standard of living of the small farmers and indirectly the standard of living of the rural labor force.

The situation will improve if the weight of a power tiller could be controlled to such an extent that the machine will not sink too deep in the ricefield mud thus securing an undisturbed operation in support of a more efficient land preparation and resulting in a reduction of the time, energy and costs involved in the tillage of one hectare.

Agricultural tractors use complicated hydraulic systems to transfer the weight of implements onto the rear wheels of tractors but this solution is not applicable in manually controlled, small, low-cost power tillers as those used by small farmers.

It was only a result of encountered difficulties in heavily water-logged ricefields, the immense desire to solve these problems and a great deal of thinking that we were able to come up with the idea of a floating power tiller and, of course, we had to go through a process of prototype development, errors, disillusionment, corrections, new trials, adjustments, desperation, revisions, etc., and plenty of perspiring efforts before we could come to the conclusion that we have found the solution to our problem. It is a piece of appropriate technology for the small farmers, developed under pressure of local conditions and problems, designed and constructed by inspired Third World nationals for local production and use. After two years of patient trial and error researches, we were able to come up with a floating power tiller.

News of our invention spread: more farmers want to buy one; but how do I protect my intellectual property? We urgently needed a patent, but how to get one is not something you learn at University. I went to the Philippine Inventor's Commission, but was referred to a patent examiner. I told him I want to apply for an invention patent, but he rejected the idea, for reasons that it would take a long time to tell, so just why not apply for a UM (Utility Model). Being a greenhorn, I followed his advice and paid the necessary fees he requested. I later realized that it was a "paper patent" which gave me no protection at all because, four months after I had

sold two units to a person in Bacolod City, Negros Occidental, he applied for a patent which was also granted. Thus, five long years of legal battle on infringement and cancellation of his patent dragged on. My enthusiasm did not wane. I entered the Inventor's contest a year later, but was totally disappointed when one of the judges told me: "your entry is impractical." The irony of it was that we had already sold, like hot cakes, one thousand of these floating turtle power tillers. Since that time, we never entered our invented and designed products in any inventor's contest.

Since the introduction of the design of the first floating "TURTLE" power tiller, late 1976, many versions have cropped up, been revised and redesigned by individual and international institutions, yet the farmers still prefer the "orig" or original - some innovate while others struggle to imitate.

It is a universal fact that inventions have changed and modernized the world, and that the vital role of inventors as innovators in the economic development is internationally recognized. Developed and progressive countries have always considered inventions and technologies as foremost in their development strategies. Thus, it can be said that the role of inventors is that of a driving force of the technology and culture of society.

Now, I would like to present some slides of the various activities of Filipino Inventors and, of course, the appropriate agricultural machineries we designed and invented for the rural areas--but before I do, I would like to thank Dr. Arpad Bogsch, Director General of WIPO, as well as IFIA,

the State Science and Technology Commission of China, the China Association of Inventions, and the UNDP for making it possible for me to visit China again and to take part in this symposium at which I have tried to call your attention to the problems and contributions of Filipino inventors.

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HOW TO CREATE A FAVORABLE ENVIRONMENT
FOR INVENTIVENESS, PARTICULARLY IN RURAL AREAS

THE ROLE OF THE CHINA ASSOCIATION OF INVENTIONS
IN PROMOTING INVENTIVE ACTIVITIES

by

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In October 1985, the China Association of Inventions (CAI), an organization that represents the interests of inventors and promotes mass inventive activities, was founded in Beijing, China. At the founding conference, Fang Yi, who was State Councillor at that time, pointed out in his address of congratulations on behalf of the Party and the Government that: "this is an event of significance and far-reaching influence in the history of the development of Chinese science and technology." The activities and achievements of the CAI in the three years since its founding show that the Association is needed and welcomed by Chinese inventors, and appreciated and supported by the competent departments of the Chinese Government, the All-China Federation of Trade Unions and the China Association for Science and Technology. As a home for inventors and source of assistance to government departments in charge of invention affairs, the CAI plays an active role in promoting inventive activities.

I. THE FOUNDING OF THE CAI

In July 1984 more than 100 scientists, inventors and leading cadres keen on invention work proposed the establishment of the CAI, which was soon approved by the Party Central Committee and the State Council. After some preparatory work, the CAI was formally set up on October 16, 1985. It must be pointed out here that the CAI was established

not by virtue of arbitrary decisions or according to the will and desire of a few people, but in response to objective needs. Of course we are always grateful for the wisdom and foresight of the 100-odd initiators who first saw the need and made the proposal.

The CAI is the inevitable product of China's reform, its opening up to the outside world and economic development, and a must for the development of China's science and technology.

Within this general strategy of reform, opening up to the outside world and vigorous development of the commodity economy, science and technology have been given special emphasis. Inventions and innovations are important component parts of science and technology and the most dynamic factors in productive forces. Inventive achievements, which are closely related to production and people's livelihood, are capable of promoting the growth of the economy and the improvement of people's living standards. It is therefore only natural that they should receive the concern and attention of the people and the Government. In 1978, the State Council repromulgated Regulations on Rewards for Inventions, which stipulated material and moral encouragement for inventors. The State Science and Technology Commission was responsible for the implementation of the Regulations. This was in line with our Party's traditional practice of encouraging inventions. The reform and opening up resulted in technology being included in exchanges. The conception according to which "technology is also a commodity" was being fostered in the mind of the Chinese people. The rapid expansion of the domestic and foreign technology trade then placed the question of the legal protection of technological achievements on the agenda. China's Patent Law came into force on April 1, 1985, signalling

that the measures adopted by the State for the protection and rewarding inventive achievements were being gradually perfected. This has undoubtedly given great impetus to the people's enthusiasm for inventions and innovations, and led to the vigorous development of inventive activities in China.

Practice has shown that it is far from enough to encourage and protect inventions by governmental administrative means. What is also needed is constant organizational efforts from below to advance mass inventive activities. The purpose of encouraging and protecting inventions is to promote technological progress and economic development, while extensive mass inventive activities provide the basis for inventive achievements. This constitutes the first necessity for the establishment of the CAI.

Inventors, especially independent inventors, need an organization to speak for them, to safeguard their legitimate rights and interests and assert their claims. This constitutes the second reason for the establishment of the CAI. It is true that regulations on rewards for inventions and the patent law have been promulgated, but in real life people have an inadequate or different understanding of some inventions. For example, owing to their incomprehension of the importance of inventions, egalitarian thinking and jealousy, together with the bureaucracy and low work efficiency prevalent in some administrative departments, the legitimate rights and interests of inventors are often prejudiced. Some inventors suffer losses because they have little knowledge of the regulations and the law, so that they do not know how to use them to protect their rights and interests. In addition, because our legal system is not yet perfect, people have insufficient understanding of the implications of on-the-job and off-the-job

inventions, of the rights of independent inventors, of the rights and duties of inventors who cooperate with other individuals or organizations, and of the State's rules and regulations concerning preferential treatment for inventions and new products, the interests of inventors cannot be fully ensured. When inventors, especially independent inventors, meet with difficulties during their inventive work, they need to have a channel through which to present their problems and seek help.

The third reason for the establishment of the CAI is the need to discover and cultivate inventors. Our country values highly and indeed cherishes talents in various fields, and has adopted a series of measures to bring the necessary enthusiasm into full play. However, inventors are talented people engaged in complex creative labor. Sometimes they are misunderstood or undervalued, or even suffer unbearable ridicule and repression. This leads to the danger of the inventors becoming demoralized or frustrated. Some amateur inventors may lose the confidence and courage to make inventions because of the time and energy wasted on bad choices of invention topic and method. Therefore it is imperative to publicize the creative work of inventors and their contributions to society, so as to create a favorable social environment in which inventors are respected by the whole of society, yet at the same time provide guidance for the amateur inventors in their inventive activities so as to enhance their interest and ability and bring good results smoothly.

All the above is expressed in concentrated form in Article 2 of the CAI constitution: "the purpose of the China Association of Inventions is to arouse the enthusiasm for invention and innovation that is dormant in the masses,

to provide guidance and impetus for inventive and innovative activities, to identify and support inventive talents, to protect the just rights and interests of inventors and to accelerate the development of science and technology."

II. ACTIVITIES AND ACHIEVEMENTS OF THE CAI

Over the past three years the CAI has conducted the following main activities pursuant to its constitution:

1. Provision of Opportunities for Inventors to Display their Inventive Achievements to Society

We sponsor a nation-wide inventive achievement exhibition once every year. Party and Government leaders are invited on that occasion to attend the opening ceremony and cut the inaugural ribbon, inspect the exhibits, talk with the inventors and award prizes. At the same time, an assessment committee composed of experts is organized to evaluate the inventions according to their originality, complexity and practicality, and to present outstanding inventors with gold, silver or bronze medals, various special awards and gold medals offered by the World Intellectual Property Organization (WIPO), a specialized agency of the United Nations. Large-scale publicity is launched through the mass media to reach out to the whole of society. Businessmen come to the exhibition to choose and buy technology.

The annual nation-wide inventive achievement exhibition is welcomed by inventors, because it facilitates communication with the leaders, and offers them an opportunity to show off their inventive achievements. It also wins them understanding

and respect, promotes the application of inventive achievements and brings out talents. Every year local invention associations also hold separate invention exhibitions, assessments and competitions. Through the nation-wide network of invention associations we are able to collect about 5,000 inventive achievements each year, one-third of which can be directly applied in production. We note with pleasure that some of the outstanding inventions selected at the exhibitions are later given national invention awards. Among the items on display at the nation-wide inventive achievement exhibition, the percentage of applications for patents is growing steadily year by year. At the first exhibition in 1985, patent applications had been filed for 38% of all the items, while at the second exhibition the figure rose to 47.4% and at the third it exceeded 85%.

2. Financing of Individual and Off-the-Job Inventions, and Promotion of the Application and Development of Inventive Achievements

In order to help independent inventors solve the financial difficulties they encounter in the processing of their inventions, we have set up an Invention Fund. A committee of the Fund, composed of more than 20 experts from various fields, was organized to examine applications and determine grant amounts. So far the committee has met three times and approved 47 projects with loans totalling 870,000 yuan.

The Invention Fund is financed from government allocations and contributions from individuals, organizations and enterprises. Mr. Henry Ying Tung Fok from Hong Kong made a donation to the CAI for its work.

The Invention Fund mainly provides grants for research, experimentation and improvement work in the process of taking an invention from its embryonic form to completion. In order to help inventors turn their inventive achievements into products, the CAI plans to set up an Inventive Technology Development Corporation in the second half of 1988. Inventors may use their technology as shares while the corporation provides the capital, and together they will develop inventive technology.

3. Organization of Publicity and Training

An important way of promoting inventive activities is to advertise extensively the significance and role of inventions in our modernization program, to publicize the hard work of inventors and their contributions to society, and to enhance the invention-consciousness of society as a whole, and also promote respect, care and support for inventors. The nation-wide inventive achievement exhibition is in fact a concentrated embodiment of that publicity effort, but the CAI also arranges for more regular efforts. In pursuance of the CAI's purpose, we have made inventors and their achievements the theme of such short-term publicity work, which aims to improve the social status of inventors. In the past two years Invention and Innovation, the official journal of the CAI, has featured nearly 100 representative inventors, both men and women, old and young, with different educational backgrounds and from different professions. Meanwhile we also give wide publicity to outstanding inventors through other newspapers and journals. There is evidence that these unremitting efforts have paid off in the improved working conditions of many inventors and in the application of inventive achievements. Some inventors have been elected to the National People's

Congress, the National Committee of the Chinese People's Political Consultative Conference or local people's congresses and political consultative conferences. The CAI also publishes an annual report, publicizing and recording the main activities carried out each year.

In order that information and experience about activities may be exchanged between the various local departments, over and above the adequate coverage in the journal of the CAI, many local associations have also compiled Work Bulletins, which are distributed among various local associations and their members.

The training of inventors and invention enthusiasts has just started. It is divided into two types: knowledge of patent law and the technology trade, and creative thinking and inventive techniques. The CAI has run training courses on the development of creative power, and published Invention and Innovation Book Series, while its official journal often carries articles on the subject. Various local associations are also very active in sponsoring lectures and training courses. For instance, the Shanghai Association of Inventions has organized nine lectures on patent law and technology contract law. The Hangzhou Association of Inventions has run 19 training courses on general patent knowledge, and issued a leaflet entitled Seven Questions Concerning Patent Applications. These training efforts have had some favorable effects on the guidance of inventive activities and the spread of patent knowledge, but they still fall short of demand because they were started only quite recently.

4. Organizational Buildup

Prior to the founding of the CAI six provinces and municipalities, namely Beijing, Tianjin, Wuban, Hangzhou,

Helongjiang and Changchun, took the lead in setting up local invention associations. Since the founding of the CAI, many other provinces and municipalities have made active preparations. So far 28 provinces and municipalities have set up local invention associations. At its 1987 annual conference, the CAI decided to accept member organizations. The rapid growth of the CAI is an indication of its appeal.

5. Orientation towards the Outside World and Creation of International Ties and Cooperation

Inventive achievements are the common wealth of mankind. On the basis of that assumption, the CAI, in an effort to serve the whole of mankind with Chinese inventions, began to organize Chinese inventors to take their achievements to the outside world in the form of international invention exhibitions from the second year of its founding. Over the past three years, we have arranged participation in nine international invention exhibitions held in Geneva, Zagreb, Paris and Montreal. Our exhibits won favorable comments from foreign inventors and the attention of international business circles.

Foreign friends know very little of our inventive technology owing to our long period of isolation. The new open policy has provided us with opportunities for contacts with the outside world, and through such contacts our inventors have increased their self-confidence, acquired new knowledge, explored possible technology exports and enhanced their understanding of and friendship with their foreign counterparts. We are trying to sponsor an international invention exhibition in Beijing this year, so as to give more Chinese inventors the chance of learning from advanced foreign technology and offer foreign friends a golden opportunity of prospecting for technology transfers on the vast Chinese

market. On the instructions of CAI President Wu Heng, we will continue to take part in the Geneva and Zagreb exhibitions while seeking to expand our participation in overseas invention exhibitions in other regions.

In 1986 the CAI joined the International Federation of Inventors's Associations with a view to increasing contacts with foreign colleagues and exchanging experience. Sure enough, we have won support and help from the IFIA and WIPO. On the occasion of the third anniversary of the founding of the CAI, we were very pleased and honored that Beijing has been chosen for the holding of a symposium jointly sponsored by WIPO and IFIA and also the latter's annual General Assembly. Every year WIPO provides the gold prizes for our nation-wide inventive achievement exhibition. Mr. Farag Moussa, head of WIPO's Section for Relations with International Organizations and Promotion of Innovation in Developing Countries, has kindly mailed us the materials we require. The presidents of the invention associations of a number of countries have given us the benefit of their valuable work experience for which we are deeply grateful.

Finally let me conclude my speech by quoting a remark by our Honorary President Nie Rongzhen, who said in his message of congratulations to the third nation-wide inventive achievement exhibition held last year that "the work of the CAI is full of vitality and extremely popular. There is still a large potential to be tapped. I hope our comrades will go all out and work ceaselessly and unremittingly to promote mass inventive activities still further, and make greater contributions to the modernization program during reform!" The Honorary President's remark is a good summary of the CAI's role and its future goal.

