

A Brochure on Intellectual Property Rights For Universities and R&D Institutions in African Countries

For more information contact the:
World Intellectual Property Organization

Address:
34, chemin des Colombettes
P.O. Box 18
CH-1211 Geneva 20
Switzerland

Telephone:
41 22 338 91 11

Fax:
41 22 733 54 28

e-mail:
wipo.mail@wipo.int

or its New York Coordination Office at:

Address:
2, United Nations Plaza
Suite 2525
New York, N.Y. 10017
United States of America

Telephone:
1 212 963 6813

Fax:
1 212 963 4801

e-mail:
wipo@un.org

Visit the WIPO website at:
<http://www.wipo.int>

and order from the WIPO Electronic Bookshop at:
<http://www.wipo.int/ebookshop>



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The World Intellectual Property Organization (WIPO) was established by its Member States - of which there are currently 179 – as a vehicle for promoting the protection, dissemination and use of intellectual property throughout the world for economic, cultural and social development.

The Organization provides services both to its Member States and to the individuals and enterprises that are constituents of those States.

The services provided by WIPO to its Member States include the provision of a forum for the development and implementation of intellectual property policies internationally through treaties and other policy instruments.

The services provided to the private sector by WIPO include the administration of systems that make it possible to obtain protection for patents, trademarks, industrial designs and geographical indications in multiple countries through a single international procedure.

Further information about WIPO and its work can be found at the Organization's website – <http://www.wipo.int> – or by writing

*World Intellectual Property Organization (WIPO)
34, chemin des Colombettes
P.O. Box 18, 1211 Geneva 20, Switzerland*

*For information concerning innovation promotion contact:
The Division for Infrastructure Services and Innovation Promotion
Telephone: (41 22) 338 94 91 • Fax: (41 22) 338 9764
e-mail: innovpro.mail@wipo.int*

Foreword

This brochure entitled “Intellectual Property Rights – An Outline for Universities and R&D Organizations in African Countries,” is the first of its kind to be published by the World Intellectual Property Organization (WIPO), bringing to the forefront the importance of intellectual property related issues to research and development in Africa.

Raising awareness of such issues has been one of the driving forces of this Organization and this brochure lends weight in putting that message across. With the increasing globalization of the world economy and the challenges facing us in this new millennium, the importance of IP rights is becoming widely recognized as the crucial factor in safeguarding the results of technological development. We hope that this brochure will allow researchers in African universities to understand the IP system better and establish ways to ensure their efforts may eventually lead to potentially sustainable benefits, both financially and intellectually, for their organizations and countries.

WIPO is grateful to Professor Dr. Tom P.M. Ogada, Associate Professor of Energy and Environmental Engineering, Department of Production Engineering, at Moi University in Eldoret, Kenya, for writing this brochure and highlighting how the private sector and the university system together can make a difference for all the people of the continent.



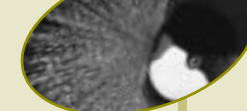
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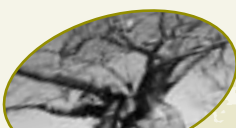
Preface

Issues related to intellectual property rights are becoming increasingly important within universities and research and development (R&D) institutions in Africa. This is particularly so with respect to the current move by most universities to generate income through consultancy, technology transfer and commercialization of innovations, inventions and research findings. Unfortunately, the current level of awareness of researchers in most R&D institutions in Africa as regards intellectual property systems is still rather low. Consequently, these universities and R&D institutions are not yet deriving full benefits from the potential of the intellectual output of their researchers. This publication is aimed at providing this awareness. Attempts have been made to present the content in a cohesive and straightforward way. It is the author's sincere hope that it will stimulate interest in the subject of intellectual property rights amongst researchers in universities and R&D institutions in Africa.





I. Relationship Between Research, Technology Development and Intellectual Property	1	III. Registration Process for Intellectual Property Rights (IPRs)	13
A. Stages of technological evolution and the role of universities and R&D institutions in African countries	1	A. General Information on Protection of Patents	13
B. Catalysts for the pace of transition of technological development between different stages	2	a) What kinds of inventions can be patented?	13
C. Challenges for research in universities and R&D institutions in African countries	2	b) What cannot be patented?	13
D. The way forward for universities and R&D institutions in Africa	4	c) Patentability requirements	13
II. Types of Intellectual Property (IP)	5	B. Filing an Application for National Registration	14
A. Patents	5	a) Potential steps for patent registration	14
a) What is a patent and what does it do?	5	b) Drafting a patent application	15
b) What kind of protection does a patent offer?	5	c) Assisting a patent agent to obtain maximum protection	17
c) What rights does a patent owner have?	5	C. Filing an Application for Regional Protection	18
d) What happens when the protection period expires?	6	a) How to get protection outside the country of origin	18
e) Why are patents necessary?	6	D. Filing an Application for International Registration	19
f) What role do patents play in everyday life?	6	– Patent Cooperation Treaty (PCT)	19
B. Utility Models	6	a) What is the PCT?	19
C. Industrial Designs	6	b) The advantages of the PCT over the traditional patent system	19
a) What is an industrial design?	6	c) Resolving the shortcomings of the traditional patent system by means of the PCT	20
b) Why protect industrial designs?	7	E. Protection of Industrial Designs	21
D. Trademarks	7	a) What can be registered as an industrial design?	21
a) What is a trademark?	7	b) What cannot be registered as an industrial design?	22
b) What does a trademark do?	8	c) Process of registering an industrial design	22
c) What kinds of trademarks can be registered?	8	d) Can international protection be granted?	23
E. Copyrights	8	F. Registration of Trademarks	23
a) What is a copyright and what does it cover?	8	a) How is a trademark registered?	23
b) What rights does a copyright provide?	9	b) How extensive is trademark protection?	24
c) What benefits may a creator of copyright have?	9	c) Protecting a trademark abroad using the Madrid Protocol	24
d) How has copyright kept pace with advances in technology?	10	d) How is an international application for a trademark processed?	24
F. Trade Secrets	10	G. Registration of Copyrights	26
a) What are trade secrets?	10	IV. Benefits of the IP System for Universities and R&D Institutions	27
G. New Plant Varieties	11	A. Importance of Patent Information Services for R&D and Other Commercial Activities	27
		a) Possible use of patent documents	27



b)	For what purpose can researchers use a patent information in universities and R&D institutions?	29
(i)	Providing solutions to technical problems	29
(ii)	Identifying alternative technologies	30
(iii)	Searching for information in a specific field	30
(iv)	Evaluating specific technologies offered for acquisition	30
(v)	Identifying potential for patentability of R&D activities at early stages of development	30
(vi)	Providing assistance during development and marketing of new products	31
(vii)	Monitoring trends in R&D activities	31
(viii)	Monitoring the success of funded R&D activities at early stages of development	31
(ix)	Solving potential disputes involving patents	32
(x)	Avoiding the risks of R&D duplication	32
(xi)	Identifying rights in the public domain	32
B.	Technology Transfer and Generation of Income Through Commercialization of IPRs	32
a)	Market evaluation	32
b)	Methods of commercialization of intellectual property	33
(i)	Selling patent rights	33
(ii)	Licensing IPRs	33
(iii)	Joint venture or collaboration	34
(iv)	Science parks and business incubators	34
(v)	University companies	34
C.	Need for Innovation and Invention Support Services for Universities and R&D Institutions in African Countries	35
a)	Importance of technology transfer centers	35
b)	Bottlenecks in the commercial exploitation of technology transfer IPRs generated by universities and R&D institutions in Africa	35
a)	How do these factors affect the process of the commercialization of innovations, inventions and research findings?	36
b)	How can the above bottlenecks be addressed?	37
(i)	Business incubators	37

	How does a business incubator work?	37
	Which services do business incubators offer?	38
	How does a university or R&D institution based business incubator work?	38
	What benefits can be obtained from institution based business incubators?	38
(ii)	Technology transfer	39
	Which services would a Technology Transfer Center offer?	39
c)	Examples of innovation and invention support structures in a number of selected universities	40

V. Need For an IPP In African Universities and R&D Institutions 41

A.	Objectives of an IPP	41
B.	Issues to be Considered by an IPP	42
C.	Coverage of IPP	42
D.	Right of Ownership	43
a)	Claim of ownership of an invention by a university or R&D institution	43
b)	Claim of ownership by a sponsor	44
c)	Claim of ownership by an individual	45
E.	Disclosure of Inventions	46
a)	General information	46
b)	The obligations of a university or R&D institution during and after invention disclosure	48
c)	The obligations of the individual inventor during and after invention disclosure	49
F.	Market Evaluation and Licensing	49
G.	Distribution of Income	50

VI. References 52

I. Relationship Between Research, Technology Development and Intellectual Property

A. Stages of Technological Evolution and the Role of Universities and R&D Institutions in African Countries

1. Based on the concept of Ungku Aziz [1], African countries must undergo the following six stages of technological evolution before they reach the final stage of innovation.
2. Stage I consists in learning operational skills such as driving trucks and performing simple line-process tasks such as assembling. High-level skills, including supervision and management, are provided by foreign workers. Semi-processed materials and parts for assembly are imported. Education is provided at primary and secondary levels. At the tertiary level (if this exists at all), more emphasis is given to the arts and social sciences than to technology, medicine and natural science.
3. Stage II involves learning maintenance and servicing skills progressively, and including the maintenance of heavy plant and equipment, and also electronic equipment. Locals are sent abroad to acquire specific skills. Universities and technical institutes are established to provide courses in engineering, technology and science, taught mainly by foreigners.
4. During stage III, the skills required for repair and replacement of imported technology are learned. At this stage more and more parts for the assembly-cum-manufacturing processes are produced locally. Universities and technical institutes train engineers, technologists and managers, who constitute local manpower for the increasingly sophisticated technological production processes. Research institutes are established and local researchers trained overseas and in local universities.
5. Stage IV entails learning the adaptation of imported designs to local conditions, paying particular attention to the unique conditions of climate, raw materials and labor, and to the practical needs of the local or regional market. At this stage, close links begin to be forged between relevant university departments

and private industry. Universities are beginning to report registration of patents in their annual reports.

6. In stage V, the skills required for the manufacture of whole products and the local construction of plants to meet local needs are developed. Regional markets are expanded in order to obtain a scale of operation sufficient to lower unit costs of production and to provide an adequately large base for technical training and R&D facilities. At this stage, the links between the public and private sectors and university and research institutes are close and mutually supportive. The intellectual property system becomes part and parcel of R&D activities.

7. Stage VI consists in learning to make machines that produce machines, as well as learning to innovate and being ready to approach the frontiers of modern technology in such fields as computers, robotics and biotechnology, using energy and raw materials without causing irreparable damage to the environment, and becoming an exporter of high technology products. The intellectual property system is already integrated into R&D activities.

B. Catalysts for the Pace of Transition of Technological Development Between Different Stages.

8. Each of the stages of technological evolution discussed above has, as a prerequisite, the successful realization of the preceding stage [1]. There is no magic way of jumping straight into the higher stages and bypassing the earlier preparatory stages. The political management of national resources, education, R&D activities and utilization of the intellectual property system can determine the pace at which a nation passes from one stage to the next (Ogada [2]).

C. Challenges for Research in Universities and R&D Institutions in African Countries

9. Universities and R&D institutions in African countries are being urged to play a leading role in spearheading technological development in Africa (Luhanga [3]). However, the need for technological advancement poses several challenges for research activities in universities and R&D institutions in African countries (Kamba [4], Birt [5] and Blume [6]).

10. The first challenge is that for a long time the almost exaggerated emphasis on the pursuit of knowledge for its own sake elevated the university to an 'ivory tower' virtually detached from the community in which it existed. However, owing to the increasing financial pressures and general shortage of resources, it has become quite clear that the pursuit of knowledge for its own sake by universities is a luxury that African countries cannot afford. Universities are expensive institutions to establish and run and normally represent a heavy drain on a country's scarce resources. The State and the community are therefore entitled to expect returns which should be seen to contribute to national development.

11. The second challenge is that universities and R&D institutions should provide the knowledge and information necessary for promoting technological development. They should do so in a way which is suitably responsive to the needs of society and to assist society to make the political, social and economic adjustments required to cope with the ensuing technological developments.

12. The third challenge is to ensure that research enables society to exploit resources, both renewable and non-renewable in a most effective and economic manner. Universities and R&D institutions are therefore required to align part of their research efforts with national needs and requirements, and to justify the value of the entire research effort to the community at large.

13. The fourth challenge is to make the best possible use of information technologies (including patent documents) which offer enormous potential advantages to research workers in the conduct of R&D activities.

14. The fifth is that universities will be strongly challenged by changing public attitudes to the morality and acceptability of certain kinds of research endeavor. It can no longer be assumed that community and government support will be forthcoming for all that can be done in science and technology. Universities will be required to provide, for public scrutiny and debate, well-balanced and comprehensive assessments of the costs and benefits of proposed introductions of new technology.

15. The sixth challenge is that there is frequently a conceptual gap between the outcome of university research and the stage at which the majority of particularly local firms can assimilate it. There is a sort of preparation stage which has to be

completed before the fruits of university research can be realized. R&D starts with the basic idea arising from fundamental research and the extension of such an idea to experimental use through applied research. This is followed by the introduction of new processes by development, the design of new products, their manufacture and finally, the maintenance and servicing of the products sold in the market. Universities in Africa must have organizations in place tailored specifically to this role. Furthermore, the role of universities in developing small and medium-sized industries, which are typical of African countries, is important. Here, an effective university role appears to depend on a holistic approach, bringing together the variety of disciplines found in universities. Moreover, successful university links with emerging industry seem often to derive from the prior involvement of universities in their planning and infrastructure development. A structure within universities designed to provide the linkage is essential.

D. The Way Forward for Universities and R&D Institutions in Africa

16. In order to address the above-mentioned challenges, universities and R&D institutions in Africa need to learn from the experience of institutions in developed countries as well as developing countries in Asia and Latin America (Ogada [7] and CHE [8]). These institutions have managed to forge closer links with industries and government departments, contribute effectively to countries' development and generate income to support teaching and research activities. They have achieved successes through activities such as:

- commercialization of innovation, inventions and research findings;
- royalties and fees from licensed patents and innovations;
- consultancy, research contracts and sponsored research;
- companies owned by institutions and joint ventures.

17. Experience has also shown that to undertake the above effectively, most of these institutions provide adequate awareness of intellectual property rights and have in place intellectual property policies. They also have support structures such as business incubators, technology transfer centers, patent service offices and industrial parks for technology transfer and commercialization of innovations, inventions and research findings.

11. Types of Intellectual Property (IP)

18. There are several types of intellectual property, which a university or R&D institution may wish to pursue [9-17]. These include:

- patents;
- utility models;
- industrial designs;
- trademarks;
- copyrights;
- trade secrets, and;

A. Patents

a) What is a Patent and What Does it Do?

19. A patent is an exclusive right granted for an invention, which sometimes is a product or a process that provides a new way of doing something, or offers a new technical solution to a known problem. A patent provides protection for the invention to the owner of the patent. The protection is granted for a limited period, generally 20 years from the filing date of the patent application.

b) What Kind of Protection Does a Patent Offer?

20. Patent protection means that the invention cannot be commercially made, used, distributed, imported or sold without the patent owner's consent. These patent rights are usually enforced in a court which, in most systems, holds the authority to stop patent infringement. Conversely, a court can also declare a patent invalid upon a successful challenge by a third party.

c) What Rights Does a Patent Owner Have?

21. A patent owner has the right to decide who may or may not use the patented invention for the period in which the invention is protected. The patent owner may give permission to, or license, other parties to use the invention on mutually agreed terms. The owner may also sell the right to the invention to someone who will then become the new owner of the patent. A patent owner does not necessarily have the right to use the patented invention – there may exist superior (earlier) patents of third parties that in case of use might be infringed.

d) What Happens When the Protection Period Expires?

22. Once a patent expires, the protection ends and an invention enters the public domain, i.e. the owner no longer holds exclusive rights to the invention and the invention becomes available for commercial exploitation by others, free of charge.

e) Why are Patents Useful?

23. Patents provide incentives to individuals by offering them recognition for their creativity and material rewards for their marketable inventions. These incentives encourage innovation, which ensures that the quality of human life is continuously enhanced. Patent owners and licensees may enjoy commercial advantages because of the exclusivity position given by a patent. Patents are ideal vehicles for technology transfer.

f) What Role Do Patents Play in Everyday Life?

24. All patent owners are obliged, in return for patent protection, publicly to disclose information on their invention in order to enrich the total body of technical knowledge in the world. Such an ever-increasing body of public knowledge promotes further creativity and innovation by others. Patents therefore provide not only protection for the owner but valuable information and inspiration for future generations of researchers and inventors.

B. Utility Models

25. In general terms, utility models protect "small inventions" which may be less inventive and thus may not be protected under a patent. The inclusion of utility models in the intellectual property system in some African countries has the primary objective of encouraging rapidly evolving, native innovations, particularly in small and medium-sized enterprises as well as the informal sector. Most universities and R&D institutions in Africa are currently being urged to take an active part in the development of small and medium-sized enterprises in their respective countries.

C. Industrial Designs

a) What is an Industrial Design?

26. An industrial design is the ornamental or aesthetic aspect of an article. The design may consist of three-dimensional features, such as the shape or surface of an article, or of two-dimensional features, such as patterns, lines or color. Industrial designs are applied to a wide variety of products from industry and handicrafts: from technical and medical instruments to watches, jewelry and other luxury items; from domestic wares and electrical appliances to vehicles and architectural structures; from textile designs to leisure goods. To achieve protection under most national laws, an industrial design must appeal to the eye. This means that an industrial design is primarily of an aesthetic nature and does not protect any technical features of the article to which it is applied.

b) Why Protect Industrial Designs?

27. Industrial designs are what make an article attractive and appealing, hence they add to the commercial value of a product and increase its marketability. When an industrial design is protected, the owner - the person or entity that has registered the design - is guaranteed an exclusive right against unauthorized copying or imitation of the design by third parties and in some countries (like in the European Union) even protects in an absolute sense, like a patent against unauthorized use by others. This helps to ensure a fair return on investment. An effective system of protection also benefits consumers and the public at large, by promoting fair competition and honest trade practices, encouraging creativity, and promoting more aesthetically attractive products. Protecting industrial designs helps economic development, by encouraging creativity in the industrial and manufacturing sectors. They contribute to the expansion of commercial activities and the export of national products. Industrial designs can be relatively simple and inexpensive to develop and protect. They are reasonably accessible to small and medium-sized enterprises as well as to individual artists and craftsmen, in both industrialized and developing countries.

D. Trademarks

a) What is a Trademark?

28. A trademark is a distinctive sign which identifies certain goods or services as those produced or provided by a specific person or enterprise. The system helps consumers to identify and purchase a product or service because its nature and quality, indicated by its unique trademark, meet their needs.

b) What Does a Trademark Do?

29. A trademark provides protection for the owner of the mark by ensuring the exclusive right to use it in order to identify goods or services, or to authorize another person to use it in return for payment. The period of protection varies but a trademark can be renewed indefinitely, beyond the time limit on payment of additional fees. Trademark protection is enforced by the courts which in most systems have the authority to block trademark infringement. In a broader sense, trademarks promote world-wide initiative and enterprise, by rewarding the owners of trademarks with recognition and financial profit. Trademark protection also hinders the efforts of unfair competitors, such as counterfeiters, to use similar distinctive signs so as to market inferior or different products or services. The system enables people with skill and enterprise to produce and market goods and services in the fairest possible conditions, thereby facilitating international trade.

c) What Kinds of Trademarks Can Be Registered?

30. The possibilities are almost limitless. Trademarks may be one or a combination of words, letters and numerals. They may consist of drawings, symbols, three-dimensional signs such as the shape and packaging of goods, audible signs such as music or oral distinguishing features and smells.

31. In universities and R&D institutions, a trademark may be important where the institution owns an enterprise, and sells goods and services. For example, the University of Florida developed an electrolyte replacement for use by its football teams. The formula was patented and had value and the trademark (Gatorado) had similar value. The patent ran out after 17 years but the trademark remained in force and continued to produce income for the University.

E. Copyrights

a) What is a Copyright and What Does it Cover?

32. Copyright is a legal term describing rights given to creators for their literary and artistic works. The kinds of works covered by copyright include literary works such as novels, poems, plays, reference works, newspapers, computer programs, databases, films, musical compositions, choreography, artistic works such as paintings, drawings, photographs and sculpture, architecture, and advertisements, maps, and technical drawings.

b) What Rights Does a Copyright Provide?

33. The creators of original works protected by copyright, and their heirs, have certain basic rights. They hold the exclusive right to use or authorize others to use their works on agreed terms. The creator of a work can prohibit or authorize:

- its reproduction in various forms, such as a printed publication or sound recording;
- its public performance, as in a play or musical work;
- its recordings, for example in the form of compact discs, cassettes, or videotapes;
- its broadcasting, by radio, cable, or satellite;
- its translation into other languages, or its adaptation, such as a novel into a screenplay.

c) What Benefits May a Creator of Copyright Have?

34. Many creative works protected by copyright require mass distribution, communication, and financial investment for their dissemination (for example, publications, sound recordings, and films). Hence, creators often sell the rights to their works to the individuals or companies best able to market the works in return for payment. These payments are often made dependent on the actual use of the work, and are then referred to as royalties. These economic rights have a limit, according to the relevant World Intellectual Property Organization (WIPO) treaties (such as the Berne Convention), of at least 50 years after the

creator's death. National law may establish longer time limits. This limit enables both creators and their heirs to benefit financially for a reasonable period of time. Copyright protection also includes moral rights, which involve the right to claim authorship of a work and the right to oppose changes to it that could harm the creator's reputation. The creator - or the owner of the copyright in a work - can enforce rights administratively and in the courts, by inspecting premises for evidence of production or possession of illegally made - "pirated" - goods related to protected works. The owner may obtain court orders to stop such activities, as well as seeking damages for the loss of financial rewards and recognition.

d) How Has Copyright Kept Pace With Advances in Technology?

35. Many owners of creative works do not have the means to pursue the legal and administrative enforcement of copyright, especially given the increasing world-wide use of literary, musical and performance rights. As a result, the establishment of collective management organizations or societies is a growing trend in many countries. These societies can provide members with the benefits of the organization's administrative and legal expertise in, for example, collecting, managing, and disbursing royalties gained from the international use of a member's work. The field of rights related to copyright has expanded enormously with the technological progress of the past few decades, which has brought new ways of spreading creations by such forms of world-wide communication as satellite broadcasts and compact discs. Dissemination of works via the Internet is merely the latest development which raises new questions concerning copyright. WIPO is deeply involved in the ongoing international debate to shape new standards for copyright protection in cyberspace. The Organization administers the WIPO Copyright Treaty and the WIPO Performances and Phonogram Treaty (often known together as the "Internet Treaties"), which set down international norms aimed at preventing unauthorized access to and use of creative works on the Internet or other digital works.

F. Trade Secrets

a) What Are Trade Secrets?

36. Trade secrets comprise confidential data, information or compilations used in research, business, commerce or industry. Universities and R&D institutions, government agencies, business entities and individuals may own and use trade

secrets. The information may include confidential scientific and technical data and business, commercial or financial information not publicly known, which is useful in an enterprise and that confers competitive advantages on a person having the right to use such information. The secrecy of the information must be maintained so as to preserve its trade secret status.

37. Trade secrets information may be disclosed or shared under the terms of a confidentiality agreement. Confidential information may be created in sponsored research projects. In this case, the sponsor will generally require the university or R&D institution and the creator to preserve the secrecy of the information. Trade secrets in the form of know-how may be vital to the practice of patented inventions and other innovations. Trade secrets information may have considerable value by itself or in conjunction with other forms of IP.

38. A familiar example of a trade secret is the formula for Coca-Cola. If the formula had been patented, it would no longer be a secret since patent law requires public disclosure of the invention. Anyone who independently and legitimately discovers the secret of the Coca-Cola formula can use that discovery and the Coca-Cola Company would have no legal means to stop them.

39. Some universities, however, may have certain reservations as regards trade secrets protection, arguing that this does not augur well for openness in knowledge sharing which is part of academic missions.

G. New Plant Varieties

40. Currently, most Universities and R&D institutions in African countries are involved in research in areas such as crop production, livestock and animal health, forestry, fisheries and crop storage. Research efforts in these areas have led to a number of specific achievements e.g. varieties of many crops, which are capable of producing high yield, more adapted to specific farming systems, resistant or tolerant to main diseases and pests, etc. These varieties are made available to farmers through existing seed services. For each variety, descriptive data are also available. They give a brief description of the variety: origin (group, pedigree, common name, etc.), agricultural characteristics (farming system, vegetative cycle, adaptability to biotic and/or abiotic stresses, yield, grain quality,...), etc. These data facilitate the choice of a specific variety for a relevant type of farming system.

41. Under the International Convention for the Protection of New Varieties of Plants ("UPOV Convention"), an intellectual property right, namely "Plant Breeder's Right", can be granted to a breeder [51], if the obtained variety is considered to be new, distinct, uniform, stable and has a suitable denomination. The breeder's right means that the authorization of the breeder is required before accomplishing some acts in respect of the propagating material of the protected variety. The UPOV Convention contains important exceptions to the breeder's right: The use of protected varieties in subsistence farming does not require the breeder's authorization. Protected varieties are available without the breeder's authorization for research and plant breeding and Contracting Parties to the Convention may, within certain limits, permit farmers (other than subsistence farmers) to use for propagating purposes the product of the harvest which they have obtained from the protected variety.

42. By granting a plant breeder's right, the development of new varieties of plants is encouraged in order to contribute to the enhancement of agricultural, horticultural and forestry productivity and, therefore, improvement of income and overall development.

43. In Africa, two countries (Kenya and South Africa) are currently party to the UPOV Convention. Some 20 other countries (Morocco, Tunisia, Zimbabwe and 16 countries parties to the "Bangui Revised Agreement", namely the African Intellectual Property Organization (OAPI) countries) and OAPI itself, already have a legislation in line with the UPOV Convention. Many other African countries have contacted the Office of UPOV for assistance in drafting their plant variety protection legislation.

III. Registration Process For Intellectual Property Rights (IPRS)

A. General Information on the Protection of Patents

a) What Kinds of Inventions Can Be Patented?

44. It is possible to protect inventions in any technological field, for example, a product or process in the following main areas (Cornish [15] and KIPO [19]):

- human necessities such as agriculture, foodstuffs, tobacco, personal or domestic articles and health;
- processes such as separation, mixing, shaping, printing, transportation and formation;
- engineering fields, including mechanical, electrical, civil and structural, chemical, textile instrumentation and measurement, and mining;
- science, including physics, chemistry and biotechnology.

b) What Cannot be Patented?

45. In many countries, the following are not regarded as inventions for patent protection [18]:

- discoveries or findings that are products or processes where mankind has not participated in their creation;
- scientific and mathematical methods and theories;
- schemes, e.g., investments or insurance schemes;
- business methods as such, like credit and stock methods;
- computer programs as such;
- methods for treatment of the human or animal body by surgery or therapy;
- simple presentation of information;
- inventions contrary to public order, morality, public health and safety, and principles of humanity.

c) Patentability Requirements

46. There are three major requirements for an application for the issue of a patent [15, 19-21]. These are:

- novelty;
- inventive step, and,
- industrial application or utility.

47. To be granted a patent, an invention must be new (novelty). This means that it must not have been disclosed (that is described sufficiently to enable the invention to be understood, by word of mouth, use, in any piece of printed publication or any other single way domestically or even in most elsewhere in the world), before a first application is made for the patent. In other words, the novelty requirement is denied if a claimed invention has been disclosed before the filing date of the application, or where priority is validly claimed, before the priority date of the application. Novelty therefore indicates some new characteristics which are not known from the body of existing knowledge in the relevant technical field. This body of existing knowledge is called prior art. To establish that an invention is novel, a search must be carried out in existing printed publications. These publications may include previous patent applications. The requirement that an invention must be new makes it essential that before a patent application is made, the invention must be kept secret, though a few countries do not consider a publication of the invention by the inventor himself as novelty destroying if it happened within a grace period of 1 year, for example, before the filing of a patent application. Secondly, to be patentable an invention must be a development or an improvement that is not obvious beforehand. The invention must involve an inventive step which could not be deduced by a person with average knowledge of the technical field. Finally, a valid patent cannot be obtained for something that does not work or that has no useful function. An invention must be of practical use.

B. Filing an Application for National Registration

a) Potential Steps for Patent Registration

48. The steps towards obtaining a patent can be summarized as follows:

- undertaking a preliminary search;
- finding a patent agent;
- helping the patent agent to prepare a patent application;
- filing the application and obtaining a filing date;
- requesting a search and/or examination;

- examiner searches for previous patents and studies the claims;
- examiner either approves or rejects the application;
- applicant responds to examiner's objections and requirements;
- examiner reconsiders and either approves or calls for further amendments;
- if final decision is rejection, applicant may appeal;
- if final decision is approved, then a patent is granted.

b) Drafting a Patent Application

49. The first step in securing a patent is the filing of a patent application. The applicant can be a person, company, or organizations, such as a university or R&D institution. The application forms issued by most patent offices are structured in parts or sections which are to be completed with specific information or details about the applicant, title of the invention, and the residence or addresses of the applicant and the inventor. The patent application also requires an indication of the technical field of the invention as well as the background. A description of the invention should be written in clear language and enough detail for an individual with an average understanding of the field to be able to use or reproduce the invention. Drawings, plans and diagrams may accompany a description. The application also contains various claims, i.e., information that determines the extent of protection requested by the applicant. The application should also have an abstract and, where applicable, a declaration of priority (i.e., a statement by the inventor as to whether the substance of his invention is drawn from or based upon another patent application filed earlier at a national patent office or elsewhere). Whereas the process of giving the names and addresses of the applicants and inventors is straightforward, that of providing a clear description of the invention in such a way that another person skilled in the field of the invention would understand involves more. Moreover, the applicant must define accurately his claims in the invention so that protection is ultimately given for definite claims which fulfil patentability conditions or requirements, as set out by a specific law, treaty or convention. It therefore takes skill and practice to acquire the ability to formulate and draft a patent application properly and accurately. Needless to add that basic knowledge of industrial property protection or experience in examining patent applications is very useful in drafting such applications. It is therefore recommended that the services of a trained patent agent are sought. Most national patent offices maintain a list of qualified patent agents.

50. Description: the description discloses an invention in a manner sufficiently clear and complete for the invention to be carried out by a person skilled in the art. The description shall:

- state the title of the invention as it appears in the request;
- specify the technical fields to which the invention relates;
- indicate the background art which, as far as is known to the applicant, can be regarded as useful for the understanding, searching and examination of the invention, and preferably cite the documents reflecting such art;
- disclose the invention as claimed in such terms that the technical problem and its solution can be understood, and state the superior virtues, if any, of the invention with reference to the state of the art;
- briefly describe the figures in the drawings, if any;
- set forth at least the best way envisaged by the applicant for carrying out the invention claimed;
- indicate clearly the way in which the invention is capable of being exploited in industry and the way in which it can be made and used.

51. Claims: the claims define the subject matter for which protection is sought. They should be clear and concise, and should be fully supported by the description. Information specified by the applicant as protected by the claims cannot be used freely (copied, manufactured or sold) by other person until the patent expires. Information not protected by the claims as finally granted can be used immediately by anyone. The challenge is therefore to draft the claims so that the invention is defined broadly enough to provide maximum protection against potential infringers, while at the same time being sufficiently specific to identify the invention and distinguish it from all previous inventions.

52. Drawing (s): Flow sheets and diagrams usually are considered to be drawings. The abstract is a summary of the disclosure (approximately 150 words), as contained in the description, the claims and any drawings. It indicates the technical field to which the invention pertains. It should be drafted in such a way as to allow clear understanding of the technical problem, its solution and the main use of the invention. A well-drafted abstract enables immediate understanding of the invention for the purposes of undertaking patent research. A priority document is a document which forms the basis of or refers to the application being made. Basically, a priority document would be a copy of a patent, original patent application, sometimes certified. The document is attached to the application.

c) Assisting a Patent Agent to Obtain Maximum Protection

53. An inventor should strive to assist a patent agent in obtaining the strongest possible patent and avoid unnecessary costs by providing him or her with the right information. The inventor should carefully prepare a statement covering the following points:

- subject matter of the invention;
- a broad description of the invention;
- objectives of the invention, including its main practical advantages over existing practices and products;
- the preferred practice, i.e. the most appropriate use of the invention;
- features of the invention that are new and distinguish it from what has come before. These features should be stated, regardless of whether they may be patented or not;
- the scope of the invention, i.e., the materials, compositions and conditions used to obtain the best results;
- limitations;
- results of laboratory or commercial tests illustrating both the preferred practice and the conditions under which unfavorable or hazardous results could be expected;
- lists of relevant patents or technical articles available from a literature search.

54. Filing/Priority date: when an application document is submitted to a patent office, it is subjected to a preliminary examination in order to establish that the application contains no defects. In other words, it is properly completed and provides the name and address of the applicant, title of the invention, description, claims and abstract. Also, in many countries, all relevant documents must be submitted and requisite fees paid. An application that is found to be in order is stamped with the filing date. The filing date is extremely important for the purposes of an ownership claim. This is because in some countries, if two or more people separately and simultaneously come up with an invention, the first person to file it is the owner of the invention. The priority so obtained can be used for foreign filings, see below.

55. Requesting an examination: once filed, the application is not automatically examined. The applicant must formally request a preliminary examination and search, and pay the search author examination fees. In some cases, the applicant

may wish to delay a request by an examination in order to assess the feasibility or marketability of the invention. Filing will already provide a degree of protection. There is, however, a time limit for this. For example, in Kenya, a request for an examination must be made within 3 years of the filing date.

56. Undertaking an examination and search: the patent examiner assesses the application to determine whether it is in the proper format. The next step is a study of the claims and a search among previous patents and other technical literature to find what is most closely related to the features covered in the claims. The examiner will reject what is old, obvious or improper in the claims by means of a report to the applicant or patent agent. The examiner's search often results in the rejection of some claims. This is the consequence of patent agents tending to draft broad claims in an attempt to obtain the fullest possible protection. The examiner may discover previous patents or publications, which show every feature of one or more claims in the application, thereby destroying novelty, or may consider some claims to be obvious to a person having ordinary skill in the field.

57. Responding to examiners' comments: The examiner may reject the whole application or only certain claims or may demand other changes to the application. Together with the agent, the applicant will carefully study the examiners' comments to help him or her decide whether to abandon the application or proceed with it. If he or she decides to continue, he or she will be required to prepare a reply, known as an amendment letter. This may include changing, canceling or adding some claims. On receiving the applicant's response, the examiner will study it and prepare further instructions, which may be to inform him or her that he or she will be granted a patent, or call for further amendments.

58. Appealing: in all countries, appeal mechanisms are in place, should the examiner totally reject an application.

C. Filing an Application for Regional Protection

a) How to Get Protection Outside the Country of Origin

59. An applicant may apply for a patent in different regions by means of the following possibilities [19]:

- African Regional Industrial Property Organization (ARIPO);
- African Intellectual Property Organization (OAPI), intended for French speaking countries in Africa. It is situated in Yaoundé, Cameroon and covers 14 countries;
- European Patent Office (EPO) in Munich, Germany covering 17 countries under the European Patent Organization;
- it is also possible to apply through a national patent office to any country not covered by the above organizations.

60. The African Regional Industrial Property Organization (ARIPO) is based in Harare, Zimbabwe. It is mainly for English-speaking African Countries. One of the main objectives of the Harare Protocol is to enable member countries to file a patent application in Harare, and designate the other member states in which protection is also sought. Once ARIPO grants the application, it will have a degree of protection in all the States thus designated. The application conditions, and details required in the application form and their drafting, are basically the same as these for national patent offices. There are currently (2001) 11 Member States. These are Botswana, Gambia, Ghana, Kenya, Lesotho, Malawi, Sudan, Swaziland, Uganda, Zambia and Zimbabwe.

D. Filing an Application for International Registration – Patent Cooperation Treaty (PCT)

a) What is the PCT?

61. As the name suggests, the PCT is an agreement for international cooperation in the field of patents [21-23]. It is largely a treaty for rationalization and cooperation with regard to the filing, searching and examination of patent publications, and the dissemination of the technical information contained therein. The PCT does not provide for the granting of “international patents.” The responsibility for granting patents remains exclusively in the hands of the patent offices of the countries where protection is sought (the designated countries).

b) The Advantages of the PCT Over the Traditional Patent System

62. The traditional patent system requires the filing of individual patent applications for each country for which patent protection is sought. This is with

the exception of the regional patent systems such as the African Intellectual Property Organization (OAPI) system, the African Regional Industrial Property Organization (ARIPO), the Eurasian Patent System and the European Patent System. Under this route, priority and earlier application can be claimed for applications filed subsequently in foreign countries within 12 months of the filing date of the earlier application. This means expenses for translation, patent attorneys in the various countries and payment of fees to the patent offices, all at a time at which the applicant often does not know whether he is likely to obtain a patent.

63. Filing patent applications under the traditional system means that every single patent office has to carry out a formal examination of every application filed with it. Such offices must also make a search to determine the state of the art in the technical field of the invention and have to carry out an examination as to its patentability.

c) Resolving the Shortcomings of the Traditional Patent System by Means of the PCT

64. In order to overcome some of the problems involved in the traditional system, an international treaty was drafted, discussed and finally adopted, and became the Patent Cooperation Treaty (PCT). The PCT entered into force on January 24, 1978, and became operational on June 1, 1978, with an initial 18 Contracting States. Currently there are 117 Contracting States, of which 32 are from Africa.

65. The principal objective of the PCT is to simplify and render more effective and economical the process of acquiring patent protection abroad. To achieve its objective, the PCT established an international system which allows filing with a single patent office (receiving office) of a single application (the international application) in one language and having effect in each of the States parties to the PCT, which the applicant designates in his application. For each international application, an international search is carried out. This results in a report citing the relevant prior art which may have to be taken into account in deciding whether the invention is patentable. The report is made available first to the applicant, subsequently published and thereafter sent to all patent offices in the designated countries, which then decide individually whether to grant a patent.

66. The filing, search, possibly examination and publication of an international application is called the "international phase" of the PCT procedure, whereas the "national phase" describes the last part of the patent-granting procedure, which is the task of the national offices of the designated countries.

67. Even in the most developed countries, patent offices have been struggling for years with a heavy workload (leading to delays) and with questions of how best to allocate resources so as to ensure that the patent system yields the greatest return from the available manpower. Under the PCT system, by the time an international application reaches a national office, it has already been examined as to its form by the receiving office and searched by the International Searching Authority. This enables the workloads of the national patent offices to be reduced, since they have the benefit of these international-phase centralized procedures and do not therefore need to duplicate those efforts.

68. The filing of international applications under the PCT began on June 1, 1978. By the end of 1997, a total of 348,335 international applications had been received by the International Bureau of WIPO.

E. Protection of Industrial Designs

a) What Can be Registered as an Industrial Design?

69. The following are examples of industrial designs (Muna [24]):

- the appearance of a ciondo (a popular Kenyan home made handbag);
- the pattern appearance of a pen;
- the outside appearance of a vehicle;
- the pattern on a textile item;
- furniture designs, e.g. a sofa set, dining table, and so on.

70. In most countries, an industrial design must be registered to enable it to be protected under industrial design law. As a general rule, for registration purposes the design must be "new" or "original". Different countries have varying definitions of such terms, as well as variations in the registration process itself. Generally, "new" means that no identical or very similar design is known to have existed before. Once a design is registered, a registration certificate is issued.

b) What Cannot be Registered as an Industrial Design?

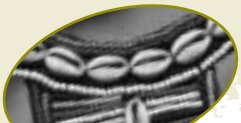
71. In some countries, the following are not included in the category of industrial designs [11,15, 24] that can be registered:

- works of sculpture, architecture, painting, engraving, enameling, embroidery, photography, and any other inventions of a purely artistic nature;
- inventions contrary to public order, morality, public health and safety;
- designs whose features correspond to, or are determined by the function to be performed by the products;
- designs that consist solely of a change in the color of a design already known.

c) Process of Registering an Industrial Design

72. Any person wishing to apply for industrial design protection must first produce an industrial design which to them appears new and original [24]. The process is more or less similar to that of registering a patent, although much simpler. The applicant is required to complete an application form for an industrial design. It must be borne in mind that protection begins at the date of filing and, if two similar applications are filed, the first to be filed will be registered while the second one will be disqualified on the grounds of lack of novelty. Inventors should therefore file their designs at the earliest possible juncture. The applicant is also required to provide four identical copies of the representation of the design, if the design applies to a single article, or five identical copies if the design applies to a set of articles. A set of articles means a unit composed of different pieces which work together, e.g., a sofa set which comprises three different items but which work together. A representation can be a photograph, a drawing or tracing, or where the design applies to textile articles, the actual specimen can be supplied.

73. Once an inventor-applicant has filed a design application, the national patent office checks whether all the required documents and items are present and in order. If it is found that some items are not in order, the applicant is informed and requested to furnish the office with the requisite information. Once the office is satisfied that the application is in order, it then proceeds to check for novelty of the industrial design. This involves comparing the existing designs with the applicant's design. If it is found that the applicant's design is new and



original, then the design is registered. Once an industrial design is registered, the duration of protection conferred by a certificate of registration for an industrial design is five years from the date of filing. The registration may be renewed for two further consecutive periods of five years each upon payment of a renewable fee. In total, an industrial design can be protected for a maximum of fifteen years.

d) Can International Protection be Granted?

74. Generally, industrial design protection is limited to the country in which protection is granted [12]. Under the Hague Agreement Concerning the International Deposit of Industrial Designs, a WIPO-administered treaty, an international registration procedure is provided. An applicant can file a single international deposit either with WIPO or under the treaty. The design will then be protected in as many member countries of the treaty as the applicant wishes. National "Second Filings" as well as The –Hague-Filings may be made with a priority claim of 6 months.

F. Registration of Trademarks

a) How is a Trademark Registered?

75. Firstly, an application for registration of a trademark must be filed with the appropriate national or regional trademark office [13]. The application must contain a clear reproduction of the trademark filed for registration, including any colors, forms, or three-dimensional features. The application must also contain a list of goods or services to which the sign would apply. The sign must fulfil certain conditions in order to be protected as a trademark or other type of mark. It must be distinctive so that the consumer can distinguish it as identifying a particular product, as well as differing from other trademarks identifying other products. It must neither mislead nor deceive customers, or violate public order or morality. Finally, the rights applied for cannot be the same as, or similar to, rights already granted to another trademark owner. This may be determined through search and examination by the national office, or by the opposition of third parties who claim similar or identical rights.

b) How Extensive is Trademark Protection?

76. Almost all countries in the world register and protect trademarks. Each national or regional office maintains a Register of Trademarks, which contains full application information on all registrations and renewals, facilitating examination, search, and potential opposition by third parties [13]. The effects of such registration are, however, limited to the country (or, in the case of a regional registration, countries) concerned.

77. The following steps are involved in the registration of trademarks (Ramba [25]):

- preliminary search either by the applicant or registrar;
- application for registration;
- examination of a trademark by a trademark office;
- advertising or publication of the trademark;
- allowing time for opposition;
- registration and issue of a registration certificate.

c) Protecting a Trademark Abroad Using the Madrid Protocol

78. In the same way as the PCT for the registration of patents, the Madrid Protocol eliminates, for the purposes of trademark protection in several countries, the need to file a separate application in each country, which is complicated and expensive [25]. The Treaty provides for the international registration of trademarks and service marks. By filing a single international application in one language (English or French) it is possible to obtain a single registration (international registration) which secures protection for a mark in several countries which are parties to the Protocol. An international application under the Madrid Protocol may be filed by any person who has a real and effective industrial or commercial establishment, or a domicile in or is a national of one of the States parties to the Protocol.

d) How is an International Application for a Trademark Processed?

79. Before a mark can be the subject of an international application, it must already have been registered, or registration must have been applied for, for the same goods or services with the trademark registration office of the country of origin. The date of filing is important, since priority can be claimed for a first

national or regional application in an international application, within six months of the filing of the first application.

80. An international application must be filed with the office of origin.

The office certifies that:

- the mark in the international application is the same as the goods and services in the national application or registration;
- the applicant is the same person as the owner of the national application or registration, and;
- the goods and services listed in the international application are covered by those listed in the basic application or registration.

81. The office of origin then forwards the international application to the International Bureau of WIPO. Fees are required for the international application. They are to be paid direct to the International Bureau although, in some cases, the office of origin may be prepared to collect and forward them. In addition, the office of origin may charge a handling fee for forwarding the international application to the International Bureau.

82. The International Bureau checks that all the filing requirements are met and that the goods and services are correctly classified. If so, the mark is recorded in the International Register. The International Bureau then gives notification of the international registration to the offices of the designated countries. The International Bureau does not examine whether the mark as such qualifies for protection, or whether an identical or similar mark has already been registered, since this is a matter for the offices of the designated countries. If no refusal is notified within the prescribed time limit, the protection of the mark in each designated country is the same as if the office of that country had registered the mark.

83. An international registration bears the date on which the international application was filed with the office of origin, provided that it reaches the International Bureau within two months and that no essential elements (such as a reproduction of the mark, or the list of goods and services) are missing. A priority claim (6 months) can be made.

84. The office of a designated country has the right to refuse protection for a mark in the territory of that country. A refusal may be made on any of the

grounds on which an application for registration filed direct with that office might be refused. Notification of refusal is given to the International Bureau and recorded in the International Register. In principle, any refusal must be issued not later than 12 months from the date on which the office concerned was notified of the designation. At the end of the applicable time limit, the holder of an international registration is therefore in a position to know whether his mark has been accepted for protection in each of the designated countries, whether protection has been refused in one country, or whether there is still a possibility of refusal on the basis of an opposition in a particular country. The holder has the same right to contest the refusal with the office that issued it as if the mark had been deposited directly with that office. Where the refusal relates only to some of the goods and services listed in the international registration, and the refusal is not contested, the mark stands protected for the remaining goods or services, without any action being needed on the part of the holder.

85. International registration lasts for ten years. Paying the requisite fees to the International Bureau may renew it for a further ten-year period. Additional countries can be designated at any time, provided they are parties to the Protocol at the time of the designation. Such subsequent designations are useful where new countries accede to the Protocol, or simply where the holder's interest in a country develops after an international registration has been made.

86. The following changes affecting an international registration can be recorded in the International Register:

- a change in the name or address of the holder or ownership of the registration;
- a limitation on the list of goods and services;
- a renunciation of the protection in respect of one or more of the designated countries;
- cancellation of the international registration.

G. Registration of Copyright

87. Copyright itself does not depend on official procedures. A created work is considered protected by copyright as soon as it is produced. However, many countries have national copyright offices and some laws allow for the registration of works for the purposes of, for example, identifying and distinguishing titles of works.

IV. Benefits of the IP System for Universities and R&D Institutions

A. Importance of Patent Information Services for R&D and Other Commercial Activities

a) Possible Use of Patent Documents

88. There are a large number of benefits which researchers from universities and R&D institutions as well as investors can derive from patent documents (Kiige [26], Sackey [27] and Misati [28]).

89. Patents form the single most comprehensive technical resource in the world. There are currently over 45 million patent documents directed towards solving technical problems, the majority of which are the first and only publication of the development described. Furthermore, patent documents generally convey the most recent information. This is so because applicants always try to file their applications as soon as possible on the principle that the first to apply will be granted the patent.

90. Patent documents have a fairly uniform presentation with respect to layout and bibliographical data, and frequently have drawings with explanations. Patent documents disclose technological information by describing the invention in accordance with the requirements of the applied patent law and by indicating the claimed novelty and inventive step with reference to the existing state of the art. They are therefore sources of information not only on what is new (the invention) but also on what is already known (i.e., state of the art), and in many cases furnish a history, in summary form, of the technological progress in the field to which they relate.

91. Patent documents normally disclose complete information on new inventions earlier than other documentary sources of technological information. For example, the invention of television by Baird had its patent published in 1923 and took five years to be disclosed in other forms of literature. Similarly, the jet engine invented by Whittle was patented in 1936 and took 10 years to be disclosed in other forms of literature.

92. Patent documents often contain information which would not be disclosed through articles or journals. Such information is divulged taking into

consideration only the legal protection which the patent affords. Many patents contain an abstract which allows a general idea to be formed of the contents of the documents within a few minutes.

93. Patent documents belonging to the same family (i.e. patent documents published in different countries but relating to the same invention) are frequently in a number of different languages. The reader may choose the document that is in the language most familiar to him. Patent documents also bear "Classification Symbols," for the purposes of maintaining search files and performing state-of-the-art searches. Industrial property offices classify patent documents according to the fields of technology to which their contents relate. The International Patent Classification (IPC) allows retrieval of patent documents belonging to any given branch of technology. Patent documents belonging to a given IPC subdivision contain a highly concentrated supply of usually technically advanced information on a given technological field.

94. Patent documents bear a date, from which conclusions can be drawn as to the age of the invention and to the question of whether the invention they describe is still under legal protection. If the invention is no longer legally protected, it can be exploited without the consent of the patentee.

95. Patent documents indicate the name and address of the applicant, the patentee, and the inventor, or at least one of these. This information allows any potential licensee to contact the person or entity concerned in order to find out under what conditions they may be authorized to exploit the invention.

96. Patent documents often disclose, in addition to concepts concerning the general utility of the invention, detailed information on the possibility of its practical application in industry.

97. Much of the information contained in patent documents has value far beyond the period of legal protection provided. Information designed for one use can have applications in quite different fields at different times and in different parts of the world. Something that originally had limited application in a single field at the time it was discovered might have a greatly expanded application at a much later date, to perhaps solve a very different problem. Often a "new" idea is really an old idea that has a new application or has recently become commercially viable. It can be seen that something long in the

public domain continues to form a valuable part of the "new" technology. Information about such an invention must be identified, modified and used quite freely and legally by all stakeholders involved with technological development.

98. Patent documents cover the entire technological spectrum and form a large accumulated store of technical literature containing a considerable portion of a collective history of technological development since the industrial revolution. Patent documentation as a whole can be considered internally to be an international network of technological information that is on hand, open to consultation and ready for use.

b) For What Purpose Can Researchers Use Patent Information In Universities and R&D Institutions?

99. Use of patent information should be an integral part of R&D activities in universities and research organizations as well as for investors, for the following purposes:

- providing technological information for research;
- providing solutions to technical problems;
- identifying alternative technologies;
- evaluating specific technologies offered for acquisition;
- identifying of rights in the public domain;
- identifying the patentability potential of R&D activities at early stages of development;
- avoiding the risk of R&D duplication;
- solving potential disputes involving patents;
- providing assistance during the development and marketing of new products;
- monitoring trends in R&D activities, and;
- monitoring the success of funded R&D activities.

(i) Providing Solutions To Technical Problems

100. A search in patent literature can potentially identify solutions to technical problems. Patent documents often discuss the difficulties of a particular process or design, which can frequently be avoided, or will include advantages of a particular process or design.

(ii) Identifying Alternative Technologies

101. A search of patent literature could help to identify an alternative solution that is more desirable, more economical, effective, efficient or environmentally beneficial. Economics are a major concern for inventors and statements concerning the economic importance of an invention are routinely included in patent documents. These include such things as the use of cheaper materials, streamlined manufacturing techniques, and a smaller number of parts, as well as providing fewer opportunities for damage and wear and tear. Use of materials and skills more readily available in a particular part of the world is also often included.

(iii) Searching For Information In A Specific Field

102. Knowledge of technology in a specific field can be gained through a search of the relevant literature. Valuable information may be provided concerning raw materials, procedures, processes or by-products in order to choose the most favorable conditions under which to implement a new solution or an established solution to a slightly different problem. Such information would also be valuable when entering into negotiations for production skills or processes.

(iv) Evaluating Specific Technologies Offered For Acquisition

103. Another problem closely related both to finding alternative technologies and negotiations for products is the evaluation of a specific technology that is available for licensing and offered for acquisition. An evaluation is needed to choose between two or more technologies, about which much information can be gained through a search of patent literature. A review of both present and past technology currently used and unused, in similar and unrelated fields, can also be evaluated.

(v) Identifying Potential for Patentability of R&D Activities at Early Stages of Development

104. For a project in the early stages of development, which produces a potentially innovative technical development, further patent searching is valuable before any decision is made on filing a patent application or maintaining secrecy. The searches would help to determine whether the development is likely to be novel and whether, when implemented, it is likely to infringe existing patents.

(vi) Providing Assistance During Development and Marketing of New Products

105. Patent searches are clearly valuable all the way through the process of initiating, developing and marketing a new product or process. They are useful for:

- competitor analysis and marketing recruitment;
- analysis of the patent activities of a given company over a period of several years can give useful pointers to future products that the company may develop;
- looking at the patent holdings of other companies can also be useful in identifying companies which are end-users of a particular product or equipment;
- analysis of the patent holdings of specific inventors within a narrow research area can be used as an aid to recruitment, since it can identify a major player in the field, whose services could then be sought.

(vii) Monitoring Trends in R&D Activities

106. Patent information can also be used to monitor technological trends as well as a competitor's R&D activities. Since patents must be applied for before any public disclosure and are normally published after 18 months, patent information serves potentially as an early warning of future trends in an organization's activities. While the publication of an individual patent does not in itself tell us much about a competitor's intentions, taken together with several similar patents, however, it provides a strong indicator of that company's likely intention to commercialize a product or process.

(viii) Monitoring the Success of Funded R&D Activities at Early Stages of Development

107. Patents have been found to be useful as a measure of the success of funded research and development programs. Once research programs are underway it is necessary to have a base for monitoring their efficiency. By looking at the nature and number of patents granted, it is possible to arrive at some estimate of the success of a program. This is particularly the case where researchers are aware of the basis of assessment and hence tend to patent worthwhile inventions.



(ix) Solving Potential Disputes Involving Patents

108. If a patent is applied for and granted, these searches should be updated regularly throughout this process to ensure that potential conflicts are identified early. Again if disputes do arise, extensive patent literature searches may be vital in determining the real strength of the relevant patents.

(x) Avoiding the Risk of R&D Duplication

109. It is important to complete a patent search in order to establish the state-of-the-art when a new research is being initiated. Not only will it alert the scientist or researcher of previous research in the area, but will also point out potential major competitors whose patents might be in force and be infringed by the results of the proposed new research.

(xi) Identifying Rights in the Public Domain

110. Patents have both a time frame and an area of protection. Patents whose legal protection has elapsed are said to be in the public domain and can be exploited freely without requiring the authorization of the original inventors. A well-developed patent documentation system when appropriately used through an adequate administration infrastructure will readily reveal rights in the public domain, which can be exploited. This facility is very important in African countries where the informal sector and small and medium-sized enterprises are considered major engines for industrial transformation.

B. Technology Transfer and Generation of Income Through Commercialization of IPRs

111. Universities and R&D institutions in African countries should strive to improve their financial status by generating income through consultancy, technology transfer and commercialization of IPRs [28-29] using internal resources.

a) Market Evaluation

112. Technology transfer and commercialization initiatives are the means by which research and development and the market place can encounter one another and ideas be transformed into products and new businesses. This is because inventions are not of any use if they are not marketed and



commercialized. The road to commercialization is rough and frustrating. It needs very careful planning, market analysis and evaluation of the various alternatives.

A number of questions must be answered before any decision to market an invention is taken or even before an invention is registered, given that the registration process can be very cumbersome. These include whether the invention can be exploited at a profit as well as the value of the invention and whether there are potential buyers. This will require an assessment of whether there is a market for the products that will result from the invention, and the product life cycle. Furthermore, if the technology is not environmentally friendly it is obvious that the invention is not an ideal technology [29].

b) Methods of Commercialization of Intellectual Property

113. Given an invention has economic and commercial value, the inventive institution has the following commercialization and marketing options [29]:

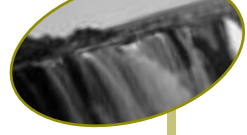
- selling patent rights and/or other IPRs;
- licensing IPRs;
- joint venture or collaboration;
- science parks and business incubators;
- university companies.

(i) Selling Patent Rights

114. It is established that most researchers are not good entrepreneurs and most universities and R&D institutions cannot effectively engage in commercial activities. In this connection, the inventor institutions may sell their IPRs to entrepreneurs. The advantage of this option is that it does not entail major expense, although the returns are small compared to other options.

(ii) Licensing IPRs

115. As in the case of the outright sale of patents, an inventor institution may not be interested in the commercial exploitation of the invention. The institution may thus enter into a licensing agreement with another company which will commercialize the invention. The inventor institution would in return receive royalties. The advantage here is that the license can be given to a number of entrepreneurs. Many entrepreneurs today manufacture under license. Famous



trade names such as Coca-Cola, Kodak, Nike and Macdonalds are some examples of licensed products.

(iii) Joint Venture or Collaboration?

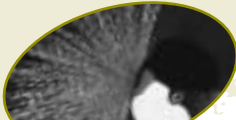
116. Universities and R&D institutions can also transfer their technology through joint ventures or collaboration with entrepreneurs. Recognizing their lack of knowledge in commercial activities, these institutions may forge strategic alliances with the business community in order to exploit their inventions. In this case, the inventor becomes more pro-active by participating in the production process. The major advantage of joint ventures is that the research institution shares the income that accrues from selling manufactured products and benefits from the business knowledge of the entrepreneurial partner. However, this route requires a certain amount of heavy investment.

(iv) Science Parks and Business Incubators?

117. Science parks and business incubators are common features within technology-based universities and R&D institutions in a number of countries, such as Brazil, Canada, China, Germany, Indonesia, Japan, Netherlands, Republic of South Korea, Sweden and USA. Science parks and business incubators have given rise to a number of spin-offs. As in the case of joint ventures, such centers feature strategic alliances between research institutions and high technology firms.

(v) University Companies

118. At an extreme, a university inventor may opt to establish his or her own business in order to exploit IPRs. Indeed, this option requires a lot of resources, both in terms of financial and human capital. The question of the involvement of university researchers in business creations looking to exploit their inventions has become a very controversial subject. The conflicting interests between the scientific and entrepreneurial roles act as an obstacle to academics' involvement in commercialization. Despite these conflicting views, it is common knowledge that some universities have incubated a number of large multinational companies. For example, Stanford University and Massachusetts Institute of Technology (MIT) have incubated a large number of spin-off companies. The number of companies set up as an offshoot of MIT has increased from 156 to 636 in 20 years. Within



a period of 50 years, MIT has transformed the economy of the State, from its traditional dependence on textiles and footwear, to its current high technology base. In Sweden, Chalmers University of Technology has created 240 companies within 30 years.

C. Need for Innovation and Invention Support Services for Universities and R&D Institutions in African Countries

a) Importance of Technology Transfer Centers

119. Universities and R&D institutions should have in place a department, unit or section, with an appropriate name such as technology transfer office, center for technology management and so on, responsible for the protection and commercial development of inventions and creations. The activities of such a unit should include the following:

- processing and safeguarding patent and copyright agreements;
- determining patentability or copyrightability (including receiving patent disclosures, undertaking patent searches as well as filing applications for patent and copyrights);
- evaluating the commercial potential of an invention;
- obtaining appropriate patent protection;
- locating suitable commercial development partners;
- negotiating and managing licenses.

b) Bottlenecks in the Commercial Exploitation of Technology Transfer IPRs Generated by Universities and R&D Institutions in Africa

120. There are several bottlenecks for the commercialization of IPRs by universities and R&D institutions in Africa [30]. These include:

- bureaucracy and civil service ventures;
- lack of clear policies on consultancy, technology transfer and commercialization of IPRs;
- lack of entrepreneurial, management and legal skills;
- lack of awareness of IPRs;
- lack of an intellectual property policy;
- lack of data banks on specialists and research findings from R&D institutions;

- insufficient marketing strategies for products and services;
- weak university-industry links.

a) How Do These Factors Affect the Process of the Commercialization of Innovations, Inventions And Research Findings?

121. Most universities and R&D institutions in Africa are characterized by bureaucratic operations and slow decision-making processes. Financial regulations governing the operation of most public institutions are, comparably speaking, more cumbersome than in private enterprises. This, coupled with a civil-service work culture characterized by low productivity, insensitivity to deadlines and quality of service, are the major impediments to universities and R&D institutions doing business with private enterprises.

122. Most universities and R&D institutions do not have in place clear and comprehensive operating guidelines to govern the day-to-day management of consultancy, technology transfer and commercialization of IPRs.

123. Most of the researchers in universities and R&D institutions do not have entrepreneurial skills. Whereas they occasionally have innovative ideas, converting these ideas into business activities is a major problem. The concept of promoting income generation through consultancy, technology transfer, and the commercialization of innovations, inventions and research findings is something new to most researchers in African universities. Another related problem is that few researchers are able to formulate business plans. However, the path towards converting innovation and invention into a business enterprise requires a detailed and well thought out business plan. Furthermore, the process of licensing technology requires negotiation and contract preparation skills which most researchers do not have.

124. A major handicap for the effective transfer of technology and dissemination of research findings from universities and R&D institutions is the lack of intellectual property policies (IPPs). As already shown, an IPP is a prerequisite for the application of commercial activities related to innovations and inventions. The presence of IPP cannot only stimulate innovations and inventions within universities, but also remove the suspicion which may exist between the university administration, researchers and, to some extent, industries. A major factor here is the policy governing the distribution of income from royalties and licenses.

Whereas universities and R&D institutions are urged to develop an IPP, there is a need to have a unit responsible for implementing the policy.

125. Most universities and R&D institutions do not maintain an up to date data bank on research findings by their staff. Such information is at best left with an individual researcher who, after managing to have it published in a reputable journal, updates his or her curriculum vitae and that is the end of it. No unit is concerned with the compilation and maintenance of such data as a way of identifying research findings with commercial potential, which could be marketed for sale to industries for the production of goods and services.

126. Currently, most universities and R&D institutions do not market their services to external clients adequately. As such, potential clients including industries as well as small and medium-sized enterprises do not know of services the universities can offer.

b) How Can the Above Bottlenecks be Addressed?

127. In order to address the bottlenecks, there is a need for universities and R&D institutions to have units which are autonomous or semi-autonomous, and are operated in a manner akin to a private enterprise, so as to provide support services for technology transfer and the commercialization of innovation and inventive activities in universities. Such units can offer the following services:

- business incubators;
- technology transfer;
- provision of patent services.

(i) Business Incubators

How does a business incubator work?

128. A business incubator coaches researchers and assists in molding their innovative ideas into successful enterprises within a very short time, normally three to five years [30-33]. This is achieved by removing most of the start-up problems so as to enable the entrepreneur to concentrate on the development of the company. Clients may include entrepreneurs direct from universities and R&D institutions, inventors and people from industry. In most cases, the innovative ideas are the result of R&D activities.



Which services do business incubators offer?

129. A business incubator may offer entrepreneurs the following services:

- assistance with issues related to IPRs;
- assistance in the preparation of business plans;
- secretarial and communication services;
- cheaper rent for work space;
- legal and financial assistance;
- marketing;
- post-graduation settlement.

How does a university or R&D institution based business incubator work?

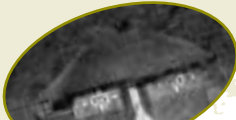
130. Most business incubation centers are large, catering for clients from various institutions, and require the direct involvement of a government authority or municipality. It is, however, possible to form institution-based incubators. Such an incubator would have the following characteristics:

- be located near or within the institution;
- have a formal relationship with the institution - be part of the institution;
- have an informal relationship - as an independent entity - with respect to day-to-day management and operation;
- possibly specialize in specific technology, and;
- possibly have a flexible graduation policy.

What benefits can be obtained from institution-based business incubators?

131. It has been shown that institution-sponsored incubators bring the following benefits to the institutions concerned:

- provide a mechanism for commercialization of institutions R&D results;
- help institutions to partake in the economic development of their countries;
- provide an opportunity for entrepreneurship and business development within the institutions as well as for graduating students.



(ii) Technology Transfer

Which services would a Technology Transfer Center Offer?

132. A technology transfer center may offer some of the following services [34-36]:

- representation of an institution in national patent offices and patent tribunals;
- promotion amongst the institution's employees of the institution of awareness of IPRs and their benefits;
- securing and safeguarding IPRs nationally and internationally;
- taking measures to prevent contravention and litigation of IPRs nationally;
- undertaking a background search as a planning tool for development projects;
- assisting with the formulation of R&D contracts;
- assisting with the patenting process;
- marketing and commercializing the invention including licensing negotiations;
- providing a complete and detailed technical description of a desired technology;
- conducting a novelty search before a research project starts;
- providing information about protected problem solutions;
- avoiding investment in problems already solved.

133. Past experience from established technology transfer centers has established that:

- patents are effective means of deriving economic values from research development and for enhancing support for research activities. Hundreds of university staff, researchers and their research programs can benefit financially from their patented and licensed technologies;
- patents are often the best way of developing and disseminating a technology. Unless a patent exists, it is unlikely that an industry will invest in the process of developing and commercializing a product and many inventions will simply "sit on the shelf" and benefit no one;

- patents are frequently essential as a basis for starting companies based on university inventions and discoveries;
- the process of obtaining a patent and marketing it to an industry provides a highly effective means of developing meaningful interaction between a university and industry, and strengthening university-industry links.

c) Examples of Innovation and Invention Support Structures in a Number of Selected Universities

134. There are several examples to learn from. The table below shows a number of support structures for 10 selected universities in the United States of America.

No.	University	Support structure in place
1	Cleveland State University	University Office for Research and Economic Development
2	Rice University	Office of Sponsored Research
3	Duke University	Office of Science and Technology
4	Cornell University	Research Foundation
5	Washington University	Center for Technology Management
6	Indiana University, USA	Technology Transfer Office
7	Indiana State University	Technology Transfer Office
8	University of Massachusetts	University Office of Commercial Ventures and Intellectual Property
9	Stanford University	University Office for Technology Licensing
10	University of West Australia	Technology and Innovation Management Ltd.

V. Need For An IPP In African Universities and R&D Institutions

135. There are several universities in developed countries which have formulated IPPs [37-50]. This chapter provides a summary of those policies.

A. Objectives of an IPP

136. There are several stakeholders in the process of commercializing innovations, inventions and research findings. These include the following:

- universities and R&D institutions;
- researchers or inventors and their research group, department, faculty, college, etc.;
- research assistants;
- students;
- postgraduate and postdoctoral fellows;
- guest researchers;
- sponsors (industry, government, other organizations);
- technology transfer unit;
- national patent offices;
- the public.

137. An IPP should harmonize the conflicting interests of all stakeholders in the process of generating and commercializing of IPRs. Generally an IPP should aim at achieving the following objectives:

- creating an environment that encourages and expedites the dissemination of inventions and new knowledge generated by researchers for the greatest possible public benefit;
- protecting the traditional rights of scholars to control the products of their scholarly endeavors;
- ensuring that the commercial results, financial or otherwise, are distributed in a fair and equitable manner that recognizes the contributions of all stakeholders;
- ensuring that both intellectual property and other research products are made available to the public through an efficient and timely technology transfer process;

- promoting, preserving, encouraging and aiding scientific investigation and research;
- establishing standards for determining the rights and obligations of a university, as well as inventors and their sponsors with respect to inventions;
- encouraging, assisting and providing mutually beneficial rewards to a university or R&D institution and its members who transfer intellectual property to the public;
- ensuring compliance with applicable laws and regulations, and enabling a university or R&D institution to secure sponsored funding at all levels of research.

B. Issues to be Considered by an IPP

138. In order to harmonize the various conflicting interests of stakeholders and realize broad based objectives, an IPP for universities and R&D institutions should discuss some of the following issues:

- coverage of IPP;
- ownership of intellectual property;
- disclosure of intellectual property;
- marketing, commercialization and licensing of patents;
- income distribution;
- rights and obligations of an inventor and the institution.

C. Coverage of IPP

139. Universities and R&D institutions need to define intellectual property broadly and their policies should be comprehensive in their coverage and holistic in their approach. However, depending on the direction of R&D activities, each institution would decide on the type of intellectual property to be included in the IPP. This may include:

- patents;
- utility models;
- industrial designs;
- copyright in literary works;

- trade and service marks;
- new plant varieties;
- trade secrets.

D. Right of Ownership

a) Claim of Ownership of an Invention by a University or R&D Institution

140. A university or R&D institution would normally own any intellectual property that is created by members of staff, students, guest researchers and so on, in the course of their employment and responsibilities, or by any person who makes significant use of the institution's resources in connection with the development of such intellectual property.

141. University resources may be defined as all the tangible resources provided by a university or R&D institution to inventors including:

- office, laboratory and studio space and equipment;
- computer hardware, software and support;
- secretarial services;
- research, teaching and laboratory assistants;
- supplies and utilities;
- funding for research and teaching activities, travel and other funding or reimbursements.

142. Each university or R&D institution is encouraged to define what does not constitute significant use of its resources. In some universities, use of library facilities, facilities available to the general public, and occasional use of office equipment and staff may not ordinarily be considered "significant use" of an institution's facilities and equipment.

143. In addition, researchers may not be considered to have made significant use of university or R&D institution resources if:

- the inventor receives advance written approval of the proposed use from the institution;
- academic or other R&D uses of facilities and equipment have priority;

- the inventor compensates the institution for the fair market value of the facilities and equipment (as actually charged by the institution to outside users);
- the inventor is not using the institution's committed time;
- the inventor does not use any institution funds in connection with the activity.

144. Normally, a university or R&D institution will own any intellectual property (including Exempted Scholarly Works) that is created by anybody who is specifically hired or commissioned by the institution for that purpose, unless otherwise provided by written agreement between such an individual and the institution.

145. A Participation Agreement is a way of enforcing an IPP, and universities and R&D institutions are advised to develop and adopt a Participation Agreement that confirms acceptance of the policy by employees, students and guest researchers, and assigns to the university or R&D institution all rights in any intellectual property in which the university or R&D institution may assert ownership.

b) Claim of Ownership by a Sponsor

146. Ownership of any intellectual property (including "exempted scholarly works") that is created in the course of research funded by a sponsor, pursuant to a grant or research agreement, or which is subject to a materials transfer agreement, confidential disclosure agreement or other legal obligation affecting ownership, will be governed by the terms of such a grant or agreement, as approved by the institution, although normally the institution would claim ownership.

147. Ownership of intellectual property that is made, discovered or created through government funding would depend on the law governing intellectual property in respective countries. In some countries (e.g., USA), while a university or R&D institution is assigned the rights to intellectual property generated during the course of government-funded research activities, the government retains the option to claim ownership in certain circumstances.

148. In some countries, intellectual property developed using government funds is owned by the government. When such contracts are in force, an R&D institution must require the employees working under such funding to assign ownership of the intellectual property to it for conveyance to the government.

149. In cases in which a university or R&D institution is a co-inventor together with an individual from another institution or business entity, and in which income is shared between the participating entities, patents shall normally be owned jointly by the participating institutions and rights of use relating to the invention and the distribution of derived royalties between the institutions shall normally be negotiated after a confidential invention disclosure, but prior to the initiation of patent filing.

c) Claim of Ownership by an Individual

150. If a university cannot or decides not to proceed in a timely manner to patent and/or license an invention, it may reassign ownership to the inventor upon request. This should be to the extent possible under the terms of any agreements that supported or related to the work.

151. Generally, patent rights to an invention made by an individual in his or her own time and without the use of an institution's resources belong to the inventor. In such cases, the institution shall not make any claim on royalties.

152. If an inventor creates intellectual property without significant use of an institution's resources, but the intellectual property closely resembles a specific research project that the inventor has conducted at the institution, it may be argued that the intellectual property was developed with the use of institutional resources. These circumstances could give rise to a dispute between the institution and the inventor (or a company for whom the inventor acts as a consultant) over ownership of the intellectual property. This would particularly be the case when such intellectual property gains substantial commercial value. In order to avoid these potentially litigious situations, members of staff should be obliged to disclose to their institutions any intellectual property that closely resembles a specific research project at the institutions.

153. Generally, students shall own any intellectual property that they make, discover or create in the course of their research unless:

- they have received financial support from the university or R&D institution in the form of wages, a salary, stipend, or research grants;
- they have made significant use of R&D institution resources in connection with the research; or,



- the research was funded by a sponsor pursuant to a grant or sponsored research agreement, or is subject to a materials transfer agreement, confidential disclosure agreement, or other legal obligation that restricts intellectual property ownership.

154. Texts of students thesis and dissertations as well as works derived therefrom are considered "exempted scholarly works." The students will therefore own the copyright to the "scholarly work," subject to a royalty-free license allowing the institution to reproduce and publish the "scholarly work." Students are normally allowed to publish their thesis and dissertations, unless they have agreed in writing to restrictions that preclude or delay publication.

155. University research contracts should protect the right of faculties, students and other employees to publish the results of their work, but may allow for brief delays to file patent applications or otherwise protect intellectual property.

E. Disclosure of Inventions

a) General Information

156. It is very advisable for universities and R&D institutions to develop and adopt a participation agreement or a patent and copyright agreement to govern disclosures of inventions. Generally speaking all researchers should be obliged to disclose all potentially patentable inventions conceived or first put into practice, in whole or in part of the course of their institutional responsibilities, or with more than incidental use of the institution's resources.

157. A disclosure is typically used to give a formal description of an invention that is made confidentially by the inventor to his/her employer. An invention disclosure is a document which provides information about the inventor(s), what was invented, the circumstances leading to the invention, and facts concerning subsequent activities. It provides the basis for determining patentability and the technical information for drafting a patent application. Such a disclosure is the "first alert" to the university that an invention has been produced. An invention disclosure is also used to report technology that may not be patented but is protected by other means such as copyright.



158. An invention disclosure is also used to report technology that may not be patentable but is protected by other means such as copyright.

159. University and R&D institutions should develop and adopt disclosure forms to assist inventors. If a university or R&D institution does not have a technology transfer unit, there should be a committee entrusted with the responsibility of receiving and processing disclosed potentially patentable inventions.

160. The key information required on the disclosure form should include:

- the invention title, names of all inventors and the descriptions of the invention;
- sponsorship, if any;
- dates of conception and putting into practice;
- publication dates, existing or projected, if any.

161. It is important to record an invention at the earliest possible stage. The record should include a written description which is as complete and accurate as possible. The description should be written to allow another person reading it to understand and reproduce the invention. The description should be written preferably in a bound notebook with numbered pages, in ink. The disclosure should be understood, witnessed and signed by a non-inventor. These actions are designed to substantiate the fact that the invention was produced on a certain date.

162. Submitting a disclosure is the first formal step in obtaining proper intellectual property protection through a university or R&D institution. Inventors are strongly encouraged to submit invention disclosures early in their invention development process so as to avoid any potential problems. The disclosure should be submitted with a written description of the invention (explanatory drawing, data, abstracts and summaries may be sufficient). The description can be brief and is often a draft of a manuscript prepared for publication. The invention description should state what the invention is, what it does and why it appears to be significant. Sketches or diagrams are helpful. A description of the most relevant technology known to the inventor may be required. The written description must be sufficiently detailed to permit a searcher or patent professional to understand the invention and to assess its patentability.

163. Premature disclosure is the release of information concerning an invention before a patent application is filed. Premature disclosure includes abstracts, poster sessions, shelved theses or even certain talks describing an invention to an open audience, even if it is given by someone who is ultimately judged not to be the inventor. Such premature disclosure may disqualify an invention for patentability purposes and in most countries, it definitely does so.

b) The Obligations of a University or R&D Institution During and After Invention Disclosure

164. In all cases of intellectual property disclosed by a member of staff for possible commercialization, the institution concerned is obliged to determine its commercial potential.

165. All intellectual property disclosures should normally be considered confidential by the institution.

166. Universities and R&D institutions should:

- educate their staff regarding intellectual property and tangible research property;
- provide support as deemed necessary or desirable;
- obtain legal protection for their intellectual property;
- facilitate the transfer of intellectual property for public use;
- develop mechanisms within the institution for the licensing and management of technology;
- provide legal support as deemed necessary and desirable to defend and protect the interests of the institutions and creators of intellectual property against third party claims or unauthorized use;
- promptly report to research sponsors any intellectual property arising from such R&D activities as are required by research and licensing agreements, and applicable laws and regulations;
- return to the creator the ownership of intellectual property which the institution decides not to patent and license;
- provide a process for settlement of disputes arising between and among the institution, sponsors and creators regarding intellectual property;
- publish or advertise the technology as deemed appropriate;
- assist the creator in finding a partner for technological development or a sponsor;

- endeavor to negotiate and manage agreements to the best advantage of the creator and the institution.

c) The Obligations of the Individual Inventor During and After Invention Disclosure

167. An inventor of new intellectual property is obliged to:

- disclose it in a thorough and timely manner;
- provide all the required assistance throughout the technology transfer process;
- arrange for the retention of all records and documents necessary for the protection of the intellectual property;
- abide by all commitments made in license, sponsored research and other agreements;
- disclose all potential conflicts of interest to the university;
- apply reasonable judgement as to whether an invention has potential for commercial marketing;
- disclose his or her invention as soon as possible and delay public disclosure of the invention until the evaluation process is complete and a patent application is filed;
- be aware that public disclosure of an invention prior to completion of the evaluation process and filing of a patent application will adversely affect the commercial value of the invention and may therefore decrease the likelihood that the institution will proceed with commercialization of that invention.

F. Market Evaluation and Licensing

168. It is essential for any patentable invention to be analyzed in terms of its industrial relevance and commercial potential. Universities, together with inventors, should endeavor to answer the following questions [50]:

- does the technology offer a cheaper and/or better way of accomplishing something?
- are competing technologies available and how much better is the invention?
- does the invention provide a technological answer to an existing problem?
- does it have the potential to create a new market?
- how much investment, in terms of both time and money, will be required to bring the invention to the market place?
- will the inventors continue to work on the invention?

- what will the potential pay-off be for a company that invests in the development of the invention?

169. The following are some of the checklists of items that need to be considered by universities when discussing a licensing agreement:

- particulars of the parties;
- definitions of territory and scope;
- obligations of the parties;
- nature of agreement;
- nature of intellectual property;
- property to be licensed or assigned, or the subject of the agreement;
- ownership of property;
- developments with regard to future patents, designs, inventions, technical information, know-how, or improvements to any of the foregoing;
- nature and extent of rights granted;
- whether technical assistance is to be given;
- whether either party has the right to assign the agreement or benefits;
- what the position of subsidiaries of the licensee is under the agreement?
- what the right of the licensee to grant sub-licences is with respect to licensed property;
- what form the sub-licence is to take;
- what the licensee's responsibility is for acts of the sub-licensee;
- what the licensee's responsibility is for maintaining confidentiality with respect to know-how;
- is the licensee to have the right to sub-contract the manufacture of articles derived from licensed property?
- payments and royalties;
- what provision is to be made for preservation of copyright?
- what is to be the date of commencement of the agreement?
- what is the duration of the agreement?

G. Distribution of Income

170. The general principle for the distribution of income is as follows:

- the university first recovers all the expenses associated with protection and exploitation of the patent or copyright;
- the net income is shared between the inventor and the institution;

- the general trend is that the inventor percentage share decreases, whereas that of the institution increases with the rise in total net revenue. For example, one American university gives the inventor 50 per cent for the first \$100,000 of net revenue, 40 per cent for the next \$300,000, 30 per cent for the next \$600,000 and 25 per cent for net income in excess of \$100,000.

171. Each institution should define the stakeholders within the institution with whom the institution's income may be shared. These may include the following:

- inventor's research group and inventor's faculty, campus etc;
- patent fund;
- operation of technology transfer center;
- research fund;
- scholarship fund and graduate education;
- inventor's research group, department, faculty and college;
- university.



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51. "BREEDER" MEANS
The person who bred, or discovered and developed, a variety,
the person who is the employer of the aforementioned person or who has commissioned the latter's work, where the laws of the relevant Contracting Party so provide, or
the successor in title of the first or second aforementioned person, as the case may be.



