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INTELLECTUAL PROPERTY TECHNOLOGY MANAGEMENT AND
ECONOMIC ASPECTS

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INTRODUCTION

Technology and Economic Growth

1. The last decade has witnessed sweeping economic changes all over the world, particularly in developing countries. Restrictive policies with respect to controls on trade and industry, foreign investment and technological collaborations have been discarded. As country after country has liberalized its economic regime, new competitive pressures have come into play.
2. The successful conclusion of the GATT negotiations, which also concluded the Agreement on Trade-Related Aspects of Intellectual Property Rights (known as the TRIPS Agreement), led to the formation of the World Trade Organization (WTO).
3. With new opportunities present, the critical role of technology as a driver of economic progress has been widely acknowledged. The value addition in most new products comes basically through intangible components, including technology.
4. The recent economic achievements of many countries have not sprung from their natural resources. Countries rich in natural resources, for example, oil producing countries, are not necessarily the great economic powers.
5. Economic progress requires a constant stream of new ideas and products to improve quality of life. Today it has become evident that innovation and creativity bring competitive advantage to companies and nations. *Per capita* economic growth of countries is driven increasingly by innovation, not by aggregate capital investment per se.

Growing Role of Intellectual Property Rights (IPRs)

6. Intellectual capital is often of considerable value because it is unique. It comprises, *inter alia*, patents for inventions, trademarks, industrial designs, utility models, appellations of origin, integrated circuits topographies, copyrights, but also know-how, trade secrets, proprietary technology, talents, skill and knowledge of the work force, training systems and methods, customer lists, distribution networks, quality management systems, etc.
7. Intellectual capital is the foundation for market dominance and continuing profitability of many leading corporations.
8. As nations and companies elaborate their new strategies, where technological superiority determines success, the question of assessment and valuation of intellectual property rights (including inventions, industrial designs, trademarks, know-how, trade secrets, etc.) assumes increasing importance.
9. Intellectual capital is a key objective in industrial mergers and acquisitions; knowledgeable companies often use licensing routes to transfer these assets to low tax jurisdictions. The role of intellectual property rights (IPR) is therefore significantly increased in the new economic and commercial forces. Intellectual capital is increasingly recognized as being among the very important assets of many of the world's largest and most powerful companies.

10. Licensing agreements and joint ventures are based on IPR assets. Novel financing techniques, leveraged buy-outs and mergers have led to emphasis of the role of intellectual property portfolios in companies. IPRs are being pledged as security for loans and assessment of the real worth of businesses increasingly requires valuation of their intellectual property portfolio.

11. At the corporate level there is an increasing awareness that active and full control over technology, new products and processes secures the way to competitive advantage. Companies focus on innovation and invention based design. Since product competitiveness falls with time, the upgrading of these products and the introduction of new ones demands well planned innovative technology inputs.

12. The neo-classical economic theory assumed technological progress essentially as an exogenous phenomenon. It is now widely acknowledged that technological progress occurs precisely as a result of entrepreneurial activities in anticipation of profits from innovations. A sound patent system contributes to the transfer of technology and research results by providing a legal environment, which encourages this behavior.

13. As creations of the human intellect, intellectual property relates to the information, which can be incorporated in tangible objects, reproduced in different locations and used by several persons at the same time. Similar to the law regarding movable and immovable property, intellectual property law is characterized by limitations, for example, limited duration of copyrights and patents.

ROLE OF INTELLECTUAL PROPERTY IN THE NATIONAL INNOVATION SYSTEM

14. In highly competitive international trade, increased importance is placed on planning and forecasting, and development of appropriate commercial and industrial strategies by enterprises, industrial groups, and countries. This strategic planning is increasingly an important part of the successful implementation of the product marketing policy of companies, and of the establishment and development of an appropriate technological base.

15. Recently, increasing importance has been given to the role of the industrial property system as an analytical instrument for such industrial planning and decision-making. Two main reasons exist:

16. First, the information aspect of the patent system: awareness of the state of the art in a particular technical field can avoid duplicative research work if the desired technology already exists. Also it can stimulate further improvements and illustrate the technological activities of competitors and, by reference to the countries in which patents have been taken out, the marketing strategies of competitors. A state-of-the-art search will identify newly developing areas of technology in which future R&D activity should be monitored.

17. Second, as a tool for industrial planning and strategic decision making, the industrial property system may be very useful through analysis of the statistical aggregation of patenting activity as revealed through published patent documents. The degree of patenting activity provides an index of which countries or companies are active in various fields, in which industries technology is progressing and in which the technology is stable and which are the enterprises active in particular technical fields. Registered trademarks bear witness of commercial interest in the market of a country or group of countries. Analyses of IPR and

their presence in different countries provide a means of testing the soundness of many policy and investment decisions.

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

- (a) it gives an incentive to the creation of new technology which will result in, *inter alia*, new products, inventions and commercial opportunities;
- (b) it contributes to the creation of an environment which facilitates the successful industrial application of inventions and new technology, and the legal framework which encourages investment, including that made by foreign countries;
- (c) it acts as a catalyst for the commercialization of inventions and their transfer to productive use;
- (d) it is an instrument of commercial and industrial planning and strategy.

LEGAL FRAMEWORK FOR DEVELOPMENT AND TRANSFER OF TECHNOLOGY

19. The patent system framework provides a necessary element of certainty for a technology transfer transaction. If a recipient were located in a country without a patent system, the supplier of the technology would need to rely on purely contractual arrangements to guarantee non-disclosure and non-use of the invention by third parties. Such arrangements may establish excessive commercial risk for technology suppliers, greater than in circumstances where the transfer transaction can be linked to a patent guaranteeing protection against third party illegal exploitation.

20. The existence of a patent also introduces another measure of certainty by enabling the potential recipient to acquaint himself with the essence of the technology which he is wishing to acquire. In the absence of a patent, such initial disclosure of the technology proposed for transfer must take place through secret disclosures and confidentiality agreements, again introducing an element of commercial risk by leakage of the technology to third parties. Furthermore, to cover such high risk the supplier generally would calculate a higher price for providing the technology.

21. The patent system must be understood as a policy instrument which encourages developing indigenous technological capabilities by providing an incentive to local inventors, research and development organizations and industry. In fact, it represents a strong shield for the development of innovative domestic industry however small it may be at the moment.

22. The patent system represents a long-term infrastructure investment to develop the national market. Without any patent system, inventors, entrepreneurs and companies would have no effective protection against the imitation of their inventions, and less incentive to invest in the development and strengthening of their technological capacities.

VALUING AND ASSESSING INTELLECTUAL PROPERTY RIGHTS (IPRs)

23. Some questions that have to be answered when assessing IPRs

- What IPR are used in the business?
- How are IPR protected?
- What is the value of IPR (as a whole and separately)?
- What is the level of risk related to IPR (infringement third party's rights, infringement by others)?
- Who owns IPR?
- Could somebody sue me or could I sue based on held IPRs?
- How can IPR be transferred or exploited to maximize return?
- What is the net present value of damages claims (corporate, environmental, personal)?

24. When valuing intellectual property rights it is essential that the assessment of all aspects of the proposed transfer is seen in the whole context of the venture. Some of the considerations in respect of technology assessment are:

Size: Is there a market for the product of the technology?

Scale: Is the scale of operation of the technology appropriate to that market?

Maturity: Is the technology market proven or is it new which will require further development?

Obsolescence: On the other hand, is the technology stale which is about to be supplemented by new developments?

Environment: Can the technology be operated satisfactorily in the licensee's environments, both climatic and cultural?

Suitability: Is the technology appropriate for the infrastructure which is available e.g., power supply, telecommunication, transport, waste disposal, etc.?

25. A common mistake of many inventors is that they try to sell their invention without taking the necessary steps to at least obtain legal protection and to develop the inventive concept into something more tangible, e.g., to file a patent application and to produce a working prototype before trying to commercialize it.

26. From the perspective of commercialization, inventions share properties with many other commodities or products, the main difference being that unlike material goods, inventions can be used simultaneously by several persons and hence they can be sold or licensed several times, to different persons.

27. Commercial and marketing strategies depend on the relation between the invention and the field of technology. Strategies will be different for mass products or for an invention in a specialized field, applicable only in the production of a few manufacturers. The market

environment, the customs and traditions, the purchasing capacity and power of people (consumers) in the area also define the methods and approaches taken.

28. Commercialization and marketing of inventions is a complex process and it needs a professional approach and expertise in order to have a chance of success. Inventors are advised to seek as much as possible professional expert assistance when they are involved in that process.

29. From the viewpoint of the owner of the invention there exist several ways for commercializing inventions:

- To start own manufacturing and marketing the product based on the invention;
- To license the rights in the invention;
- To sell the patent rights; or
- Any combination of the above.

30. The decision of which way to choose will depend on a variety of factors, among which the cost and benefits analysis will often be decisive, as well as the inventor's business strategies (or lack of them).

31. The income an invention may generate will depend directly on the investment made for its development and marketing:

- The highest return (or benefit) for the inventor may be expected when he decides to start its own production based on the invention, but this approach will require also the largest investment;
- The benefit for the inventor will be much lower when he decides to license or even to sell his patent rights at an early stage of development of his invention.

32. Each individual case should be analyzed and evaluated accordingly, taking into account the nature and properties of the invention, the needs, conditions and potential of the market, the resources available, and last, but not least, the willingness of the inventor to cooperate in further development of the invention.

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

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

35. Usually commercialization should begin on a local scale, close to the user in order to test the invented product and only upon success should one embark on large-scale commercialization and marketing (including also for export in foreign countries).

36. License partners or buyers for an invention may be approached in different manners, such as, *inter alia*, direct contacts with companies, contacts through chambers of commerce and similar organizations, contacts through industrial associations, by specialized exhibitions or by using the services of an invention broker. All contacts should be carefully coordinated and monitored by establishing a public relations plan. The commercial success of an invention will depend largely on a reliable and dynamic partnership.

37. Today, besides the creators of technology (inventors, R&D centers, universities) and the user of technology (industry, the business community and the consumers), the entrepreneur (broker, finder/creator of markets) has an increasingly important role in the commercialization and transfer process.

38. Sometimes governmental agencies could also act as brokers or promoters of inventions, however, such institutions should have an independent status with respect to business decisions existing outside the governmental or administrative system.

39. Inventors often entrust the search for partners and the commercialization of their inventions to commercial brokers. Before entering such arrangements, however, inventors should obtain as much as possible information on the activities and experience of the commercial broker and ask also for references from other independent sources. It is advisable that inventors retain the rights in the invention (patent, industrial design or utility model registration, trademark registration) and agree with the broker on a commission to be paid to him upon accomplishment of the task.

40. Practice has shown that in order to be successful in the commercialization or marketing of inventions, the owner of an invention (inventor, SME or any business entity) will need to have access to several or all of the following services:

- Technical and technological evaluation of inventions and innovative projects;
- Economic evaluation and market studies (i.e., feasibility studies);
- Legal advice and assistance;
- Contacts with potential users;
- Experience in business negotiations;
- Contacts to mobilize and attract seed and start-up capital or venture capital;
- Assistance in obtaining industrial property titles, including patenting of inventions or registering trademarks;
- Assistance in publicity matters and preparation of public relation campaigns;
- Advice and assistance in prototype manufacturing, etc.

41. Many universities and R&D organizations have established special services or units, which assist researchers and staff in obtaining protection and commercial exploitation of IPR developed under research work, etc. Furthermore they provide expert assistance on the different aspects of commercialization of inventions such as written information on general and specific business practice and ethics, on economic, financial and other laws and regulations affecting commercialization, contacts with experts in the various fields, such as patent practitioners, patent lawyers and invention brokers, etc.

ECONOMIC ASPECTS AND BENEFITS OF INTELLECTUAL PROPERTY FOR R&D AND UNIVERSITIES

42. Inventions, as a fundamental part of technology, are by nature both private goods in creation, and public goods through productive use or consumption. They are private goods insofar as their creation consumes both mental and physical resources which are thereby diverted from other production or consumption activities. However, once technology or inventions become available in the form of information and enter into being public goods, they can be used without loss to any person, and without further investment in re-creating it for new users.

43. A dilemma exists if all are free to use technology and inventions, which have been created, who will bear the cost associated with their creation? One of the basic rationales of the patent system is to provide an incentive for the creation of new technology and inventions by offering to inventors exclusive rights to commercially exploit patented inventions for a limited time in return for the disclosure of the inventions to the public.

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

45. Patents are granted on technical criteria. The exclusive rights which are conferred by the patent relate to the commercial exploitation of the invention, and patent holders are not protected against those who derive from the disclosed invention a perception of a market need which may be satisfied by the legitimate adaptation or improvement of this technology, or through the discovery of a different technical solution to satisfy the same market need.

46. Intellectual property rights are of increasing significance to the research conducted at universities and R&D organizations. They constitute part of the assets of those institutions; research may be dependent upon securing permission to use of third parties' intellectual property rights; and finally, where research teams comprise also visiting researchers, in addition to university or faculty members, there will be a difficult question of identifying ownership of any intellectual property which might be generated. The use and commercialization of intellectual property thus presents numerous management challenges.

47. Much of the funding received by national R&D and educational institutions is provided from public sources, such as governments, or charitable foundations. Consequently, institutional accountability is needed for the intellectual property emerging from such research. Universities and R&D organizations may take the view that their research results are freely available to all. However, any unauthorized person may seek to register a patent arising from that research, thereby preventing its use as a public good. This may have to be pre-empted by the educational institution seeking its own intellectual property rights which can be licensed to users on a non-exclusive basis.

48. The purpose of intellectual property ownership by a university or R&D organization is invariably to promote the fundamental research mission, to protect its integrity and welfare, to provide a resource for industry, to obtain appropriate return for the use of facilities, resources and services provided by the institution, to encourage the growth, progress and success of the

institute through ventures with industry, seeking commercial returns, to provide fair and reasonable reward (and incentive) to staff and students who apply their intellectual activity, to increase the accountability for management and use of public funds and to foster the identity of the organization and its esprit de corps.

49. Where collaborative research is to be conducted with private industry, the latter will often insist that the fruits of the research are not appropriated by some unauthorized third party. Sometimes the research will involve an elaboration of a piece of intellectual property contributed from the private sector and the contributor may insist that the educational institution has an appropriate intellectual property management policy.

50. As owner of the intellectual property, universities can apply quality assurance procedures to the evaluation, protection, development and exploitation of its intellectual property through administrative procedures dedicated to this task. It can also assist innovators in the commercialization of the intellectual property by concentrating expertise in an area available to all research teams.

51. The most effective way of establishing an appropriate intellectual property infrastructure is for the university or R&D organization to enact an intellectual property policy. Such policy statement may provide that as a general rule the university will own all the intellectual property generated by its staff and research students. This is on the basis either that the intellectual property has been created in the course of employment or that the university's resources and services have contributed to the generation of intellectual property.

52. A delicate question which can arise in relation to the intellectual property generated by a research institute is the question of ownership that property when a contribution is made by a visiting researcher. This is conventionally dealt with by requiring visitors to agree to assign any intellectual property which is developed by them with the use of the university's resources and facilities.

53. A university or R&D organization should either establish a specially dedicated research liaison office or appoint an employee with intellectual property responsibilities (IP Focal Point or IP coordinator). The decision will usually be made on the basis of funds available to pay salaries and the pace available to house relevant staff. A critical factor will be the expected revenues which is expected to be generated from intellectual property by the institution. One of the main tasks of the IP Coordinator is to promote among research staff a better understanding of the rights which the law gives for the protection of creative efforts.

54. Where the IP Coordinator decides that the institution will not exploit its ownership of intellectual property generated by its staff, the rights will be released to the innovator(s), usually subject to a non-exclusive licence to use the intellectual property for research in the institution. In those cases where the IP Coordinator forms the view that the institution should be involved in the exploitation of the intellectual property, it will work with the innovator(s) in market evaluation and in finding commercial collaborators to exploit this the IP Coordinator will be responsible for assisting the institution in the task of commercializing appropriate intellectual property rights and in negotiating agreements in conjunction with the innovators, to ensure conformity with the role and mission of the university or research institute.

CONCLUSION

55. We are witnessing growing inter-dependence in global trade and technology as costs and risks of developing new products and processes increase. Strategic alliances between companies such as licensing agreements, joint ventures, mergers, acquisitions and cooperative R&D agreements are proliferating, cutting across national borders and cultures. Alliances seek to learn and acquire from each other technologies, products, skills, and knowledge that are not available to other competitors. New relationships between universities, R&D organizations and enterprises are setting new standards in making it easier to do business together. The increasing role of technology in economic growth and the growing transfer of IPRs for competitive performance within and across borders makes this an important issue.

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