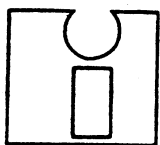


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WORLD INTELLECTUAL
PROPERTY ORGANIZATION

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

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the World Intellectual Property Organization (WIPO)
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the International Federation of Inventors' Associations (IFIA)
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CREATION OF EMPLOYMENT AND GENERATING WEALTH
BY INVENTORS AND INNOVATION

*Document prepared by Ing. Ricardo A. Ferraro, Policy Management, Science and
Technology, University of Buenos Aires, Buenos Aires, Argentina*

I. INNOVATION

“The computer I used to write this work was made of almost exactly the same materials as the one I bought ten years ago: around 15 kilos of steel, copper, aluminum, plastic and silicon, with small pieces of gold, iron oxide and various other elements mixed in. In my new PC these materials are arranged in a slightly different manner, which makes them about fifty times more useful than they were in the old configuration. No amount of saving in investment, no macroeconomic adjustment policy, no range of taxes or subsidies can generate rates sustained economic growth unless it is accompanied by the innumerable large and small discoveries that are required to create great value from a particular series of natural resources.”

Paul Romer in SUSTAINABLE FLEXIBILITY

[N.B. Translator's note: Unofficial WIPO translation]

1. The term innovation is used much more in economic and business vocabulary than in relation to technology, science or even new technologies. Why?
2. Peter Drucker responds by saying that any successful exporter has a different product. No such product is a commodity. Despite the fact that its price is competitive, it does not compete in price terms. All such products are of high added value and the added value is the result of skill and knowledge.¹
3. Following Drucker's example, we would say that the successful exporter has a different product, i.e. that is not equivalent to others and its price is not determined by the international market. In other words, it is not a commodity. Metals such as gold or aluminum, cereals such as wheat or maize, oil and different kinds of fruit, but also tires and the most common models of PCs are commodities. We also refer to commodity chips, to mention only those most commonly used.
4. Whereas a Jaguar, a wine with an appellation of origin, a Chanel perfume, a computerized tomograph, a high speed train, a drug that dilutes blood clots, a Boeing and the garments made by Benetton and Calvin Klein are different products.
5. There are significant differences between products and commodities in terms of prices, profit margins and the added value that they imply. The values added for each kilo of cereal or oil are less than ten or 20 cents of a peso or dollar, for iron and steel products they range from 30 to 60 cents, for cellulose paste 40 cents, and for meat, fish, wool or aluminum about a dollar. In relation to cars or frozen ravioli, the figure is around ten dollars. These values are compared with 600 dollars per kilo of video cassette, 1,000 dollars for aviation engines, 5,000 for a combat aircraft and 40,000 dollars per kilo of satellite.²
6. Another important contrast between products and commodities is their profit margin which is of course much greater for the former than it is for the latter.

¹Peter Drucker – *ADMINISTRACION Y FUTURO* (ADMINISTRATION AND THE FUTURE) – Editorial Sudamericana, Buenos Aires, 1993.

²Victorio Orsi – *LACUESTION DEL EMPLEO* (THE EMPLOYMENT ISSUE) – *La Prensa*, June 13, 1993.

7. The company that developed the computers which generated Terminator 2 and the dinosaur of Jurassic Park states that it stays only in the market segments which provide it with a gross profit margin of over 50 percent, i.e. the level it requires to remain in the vanguard of innovation. This company is not exceptional, however: Microsoft and Intel have similar margins.
8. However, the last words by Drucker that we quoted are perhaps those which should be most important to us, i.e. all (the different products) are of high added value and the added value is the result of skill and knowledge.
9. Skill and knowledge are manifested by means of innovations, where by innovation is the process that is based on a new form of knowledge or concept, but which concludes only with market success. An innovation is given specific form only when a product or service reaches the market. If no one pays for it and no profit is generated, there is no innovation. There may be discovery, invention, development or improvement. But not innovation.
10. Someone proposed quite rightly that just as science can be summed up in the Greek word *eureka* – which means “I have found it!” – innovations should be acknowledged by “*epolesa*,” which means “I have sold it.” If no one says “*epolesa*,” innovation does not exist.
11. But how is innovation possible? According to Porter, companies achieve competitive advantage through innovative acts. Innovation can be manifested in the design of a new product, a new production process, a new marketing focus or a new way of conducting staff training and education. A large part of innovation is commonplace, its contribution is marginal and it depends more on the achievement of a small amount of progress than on a single important technological landmark. It often involves ideas that are not even “novel”: i.e. ideas which have existed to a greater or lesser extent but that have never been vigorously pursued with a view to imposing them on the market. And it always involves investments in skill and knowledge, factories and equipment and in the promotion of prestigious marks.
12. An innovation is not always the result of scientific research or technological development; moreover, the most important innovations have resulted from the imposition of a concept.
13. A study on the economic effect of the innovations that have occurred since the Second World War stated that the innovation with the greatest effect was self-service, ranging from “take-away drinks” to automatic cash dispensers, and the second most important had been the introduction of containers. It is true that neither of these two innovations was the result of scientific or technological research, although both required many technological developments in order to be fully applicable. For example, the barcode and the containers that move containers are only two of the direct creations of these innovations.
14. It is also the case that knowledge is available but that only one person or company takes advantage of it: when SONY produced its first walkman, there were about ten companies that had all the requisite technologies. In other words, various companies were in a position to create the product, but only SONY did it and triumphed with it in the market. SONY innovated, while it may be said that the others had the knowledge but lacked the necessary skill.

15. In addition to their origin, the effect of innovation is enormous; for that reason, the prestigious journal *The Economist* expressed the view that in wealthy countries, innovation is the main driving force behind economic growth.³
16. However, in these areas it is risky to believe in linear relationships: not all technological development turns into innovation, nor do all innovations immediately change the face of the market.
17. It is commonly said that more than one generation must pass before all companies are able to dominate an innovation. For example, the first electrical engines appeared in the 1890s, but did not contribute to industrial productivity until the 1920s. Similarly, it is considered that recently in the middle of the 1990s, the effects of computers on business productivity have begun to be appreciated.
18. It should not be forgotten that during the 1980s service enterprises in the United States invested US\$800 billion in information technology, while their productivity increased by less than one percent per year.
19. We are now on the verge of a situation where we will witness the power of many new technologies – such as those related to information – as well as the enormous transformations that they will generate in terms of work and business.
20. A review of certain important innovations leads to the observation of a number of common characteristics:⁴
- innovation is based on known features . For example, the mechanical typewriter and electricity led to the production of electronic typewriters. The SONY Walkman is also an original combination of various known features;
 - one of the designs predominates , following a period of intense searches and trials. For example, at the beginning of the 1980s there were various text processing machines which were PCs with only processing software and disappeared as a result of the spread of PCs as we know them;
 - innovations shift the balance between businesses , since a period of innovation gives rise to a state of competition. However, once a design has imposed itself many companies withdraw from the market;
 - innovations cause waves of technological change , since they require new ranges of skills on the part of producer companies and therefore attract other specializations and technologies;
 - there are changes in company management , for example from Remington to Underwood (for mechanical typewriters), IBM (electronic typewriters and, subsequently, computers), Intel (chips) and Microsoft (software);

³The Economist, June 18, 1994.

⁴James Utterback –MASTERING THE DYNAMICS OF INNOVATION –Harvard Business School, 1994.

- unknown quantities emerge in the field. Major innovations rarely come from the usual players in a particular market; the most important ones generally arise in unexpected places and, faced with them, the leaders lose their positions, as was the case with IBM following the creation of Apple.

II. COMPETITION AND COMPETITIVENESS

21. The word competition comes from the Latin expression *cumpetere* which means “seek together.” Competition represents the opposite viewpoint to that of “the fight for life” with all its implications of desperation and lack of scruples. “Seek together” implies recognition of others who also participate.

22. This concept – which is usually forgotten in commercial or economic competition – continues to exist in the majority of sporting and artistic competitions. Who can contemplate winning a violin competition by cutting the strings of the instruments of other participants? Who can conceive winning a race by pushing other participants off the track? However, certain business deals appear to indicate that tricks of this nature are possible...

23. According to Thurow, competition revolves around the following questions: Who can devise the best products? Who raises the standard of living most quickly? Who has the best-educated and most specialized workforce in the world? Who is the world leader in the area of investment: factories and equipment, research and development, infrastructure? Who is the best organized? To whom do the institutions of government, education and business belong, in their capacity as world leaders from the point of view of efficiency? Being obliged by economic competitors to do all these things is something positive, not negative.⁵

24. So what is the meaning of competitiveness, which is used more and more as an objective, parameter and model in these forms of competition?

25. According to the most commonly accepted definition, competitiveness measures the ability of a company or nation to produce – in free and fair markets – goods and services which satisfy the markets, while simultaneously increasing or – as a minimum – preserving the real income of its workers or citizens.

26. What are the fundamental elements of competitiveness? How is it achieved? Is the competitiveness of a company the same as that of a country? Does it follow the same formulae?

27. In this regard, probably the best known spokesperson is Michael Porter, who sums up a number of fundamental guiding principles:⁶

- National prosperity is created, not inherited: this does not stem from a country’s natural gifts, but from the entirety of its workforce, its interest rates or the value of its currency, as conventional economics continues to state;

⁵ Lester Thurow – *LAGUERRADELSIGLO XXI (THE TWENTY -FIRST CENTURY WAR)* – Javier Vergara Editor, Buenos Aires, 1992.

⁶ Michael Porter – *LA VENTAJA COMPETITIVA DE LAS NACIONES (THE COMPETITIVE ADVANTAGE OF NATIONS)* – Javier Vergara Editor, Buenos Aires, 1992.

- The competitiveness of a nation depends on the capacity of its industry for innovation and improvement. Companies derive benefit when faced with the best competitors in the world owing to the pressure and challenge involved. They draw benefit from having strong national rivals, aggressive suppliers based in the country and demanding national clients;
- No nation is able now or in the future to become competitive in all or even the majority of economic sectors: nations triumph in specific sectors owing to the fact that the national environment is the most progressive, dynamic and stimulating in this area;
- Throughout the world, the companies that have achieved international leadership use strategies that differ from each other in all senses. However, although each winning company uses its own particular strategy, its fundamental *modus operandi* – the nature and trajectory of all those that are successful – is basically the same: they gain competitive advantages through acts of innovation. They focus innovation in the broadest sense of the term, which includes both new technologies (NT) and new ways of doing things;
- The correct role for governments is to act as a catalyst and stimulus. They must encourage – or even urge – companies to increase their aspirations and to achieve higher levels of competitive activity, even when the process may be intrinsically unpleasant and difficult. Governments cannot create competitive sectors: only companies can do so;
- The only significant concept in terms of competitiveness at the national level is productivity. Productivity is the basic factor determining a nation's standard of living in the long term; it is the fundamental principle determining *per capita* national income. The productivity of human resources determines employees' wages; the productivity generated by capital determines the profit obtained for its owners.

28. The term competitiveness comes from *competencia*, a word which in turn has various meanings:

- competence, as in the case of a judge who decides whether or not he is “competent” to hear a case;
- competition between two or more parties to achieve something; as in sport where each of the competitors attempt to win;
- the skill or ability to do something, i.e. to be ‘competent’.

29. The search for competitiveness therefore consists in making an organization's skills – or abilities – commensurate with the opportunities of the environment in which it operates.

30. The concept of competitiveness defined in this manner therefore implies a dynamic approach; it is a transition, not a final state. In reality, recognition is therefore given to competitive forms of conduct rather than competitive positions, since the principal

characteristic of the current environment is its high rate of change or upheaval. The adjustment or harmony of a company's abilities with its changing environment will be a dynamic process, with frequent corrections to the course taken.

III. IF IT'S SIMPLE, SOMEONE ELSE WILL DO IT

31. The simpler a task that someone performs, the more certain we can be in stating that there is someone else, somewhere in the world, who can do it equally well if not better and for less money, and that also a new technology will quickly supersede this form of employment.

32. Assuming that this statement is equally true for individuals as well as for companies and nations, we can now consider some examples. A traditional task, which is synonymous with hard work for anybody not requiring special training, was the "shouldering" of sacks in a port. The introduction of containers, and the equipment required to unload them from ships, move them and reload them, significantly reduced staff numbers and changed their profile: there were more crane and gantry operators and fewer stevedores. In ports that have been modernized in accordance with international standards, there has been a drastic reduction: only a dozen or so people – with university education – operate a port terminal.

33. In the case of tasks that appear to require a higher level of education, we may mention bank clerks who have been replaced by the automatic cash dispensers that have been installed in virtually all the country's banks. Another interesting example is that of secretaries who, for a number of years, were judged on the speed at which they could type. At the beginning of the 1980s, the initial appearance of word processors and, subsequently, PCs changed their profile, since they had to take on board new technologies. There was a greater reduction when many employees and bosses began to use their PCs for their correspondence and memos, and an even greater one when electronic mail eliminated a large number of the messages written on paper.

34. When a computer is installed in a complex institution with large archives – for example library catalogues or a hospital's clinical records – many operators are required to do what is commonly known as data entry, i.e. reading and typing the information into the computer memory. In addition to the amount paid for such work – the most efficient companies, established in the Philippines, offer wages of little more than a hundred dollars a month to people who have completed their secondary education and who type quickly – there is a revealing factor: that there is less and less work, since the new scanners and related software accelerate the task and avoid the need for manual work.

35. Another instructive and topical case is that of call centers. What is a call center? It is a center which receives enquiries from customers and gives information or provides services over the telephone. The number of these centers has increased rapidly in banks, insurance and telecommunications companies, as well as in those producing mass consumer goods such as foodstuffs, the packaging for which contains a "customer care" number. Why do call centers spring up and why are they established? Because selling more services to the same customer is cheaper than acquiring new customers (known as cross-selling), because this is a service that can easily be subcontracted and because it avoids strained employees having to devote themselves to a simple task when they can be doing other things such as attracting new customers and taking better care of the most important ones.

36. Of course, since it is only a matter of speaking on the telephone – while sitting in front of computers detailing a customer's history and providing services or information that the customer may require – the call center can be anywhere or, moreover, in any country. A number of North American cities and various European countries are now competing to attract the call centers of the major corporations. It is calculated that three million people work in the main telephone service centers in the Northern Hemisphere: around one and a half million in the United States and a similar number in 12,000 European call centers. In Europe, between 1995 and 1997 call centers generated more than 400,000 jobs, i.e. more than one-third of the total number of those established during that period. However, each day sees the development of more software designed to help operators work more quickly and make fewer mistakes, to simplify their task and increase their productivity. However, if each place of work is equipped with a faster and more powerful computer (which will undoubtedly happen), the operators will recognize the customer's voice and, if we add a simple "expert system" which, on the basis of the customer's words, deduces the response and learns from the things it gets right as well as its mistakes, the need for operators will very quickly be reduced.

37. From these examples, it can be confirmed that the simpler the task the easier it is for another person to do it, either in the same or a different place, and for much less money, although a new technology will also surely eliminate the task in question. It is therefore noted that both the "simplicity" of the task and the "novelty" of a technology are relative and dynamic concepts: the operation of a new technology – which today eliminates simple tasks – may in the future become simple and be replaced by a different, new technology.

38. A first conclusion to be drawn is that every day it becomes more difficult to survive by participating in the production of simple goods or services which require simple tasks.

39. What characterizes the most developed countries is the fact that a large proportion of their population participate in activities that provide added value, while only a small proportion remain on the outside. These second conclusion focuses on the need for further lifelong education for all.

IV. TECHNOLOGIES AND JOBS

40. In a climate of high unemployment, many – rightly or wrongly – associate technological progress more with threats to their position in society than with the enhancement of their opportunities. It is true that technologies both create and destroy jobs, but the balance depends more on the institutional context, the strategies adopted by companies and public policies than on technologies.^{7 8 9}

⁷ Joel Mokyr – *THE LEVER OF RICHES/Technological Creativity and Economic Progress*, Oxford University Press, 1990.

⁸ Martín Carnoy and Manuel Castells – *SUSTAINABLE FLEXIBILITY/A Prospective Study on Work, Family and Society in the Information Age*, OECD, Paris, 1997.

⁹ José Nun, *EL FUTURO DEL EMPLEO Y LA TESIS DE LA MARGINALIDAD* (THE FUTURE OF EMPLOYMENT AND THE MARGINAL MASS THESIS), *Economic Development*, Vol. 38, No. 152 (January - March 1999).

41. The extraordinary increases in flexibility and adaptability which new information technologies provide have increased productivity, although work has lost institutional protection and is ever more dependent on individual negotiation in a constantly changing labor market. Work has become a matter for individuals.

42. The distance between the winners and the losers has therefore increased, since there are very few rules which define how to win and how to lose. A handful of skills have not even been mastered, since technological change accelerates and with it the definition of which technologies and knowledge provide entitlements, and which make it possible to survive. It can be stated that work has never been so important in the value generation process.

43. However, the future situation is not irreparable, since we are not entering a period of increasing mass unemployment, but rather we are undergoing the crisis of a historical transition, in each society, owing to the contradictions that exist between the opportunities for new technology and the social organization of labor. What is at stake is the idea that stable, well-remunerated salaried employment as a real and achievable prospect for a large part of the available workforce will come to an end.

44. The new worker can be characterized as a free-floating individual, connected on line to a series of organizations which perform different tasks, in permanent competition for resources, and assume limited responsibilities towards a restricted number of persons for limited periods of time. In such circumstances, not only is society at risk but the potential wealth that may be released by the technological revolution is also determined. The broader and deeper the dissemination of information technologies in workplaces, the greater the need for self-sufficient and educated workers who are willing and able to plan and decide whole sequences of their work. Despite the fact that there will always be routine tasks for a number of poorly trained workers, the future of work in advanced societies will be dominated by intelligence-intensive tasks. This is not to say that everyone must be a programmer or an analyst, since nursing, security and food preparation duties may and will be activities rich in information for highly trained people.

45. It is important to note that increases in productivity do not necessarily generate unemployment: everything depends firstly on how those increases are achieved and, secondly, on whether or not overall demand exists which is able to absorb the resulting increase in production. The latter no longer constitutes a direct effect of technological change but is a result of the macroeconomic policies adopted and, finally, of the balance of power that exists, as well as of the prevailing social, political and ideological context.

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¹⁰ Ricardo A. Ferraro – *EDUCADOS PARACOMPETIR (TRAINED TO COMPETE)/The Argentine nation and the myths and realities of the twenty-first century* – Editorial Sudamericana – Buenos Aires, 1995.

¹¹ Ricardo A. Ferraro – *EDUCADOS PARACOMPETIR (TRAINED TO COMPETE)/The Argentine nation and the myths and realities of the twenty-first century* – Editorial Sudamericana – Buenos Aires, 1995.

¹² Ricardo A. Ferraro – *LAMARCHA DE LOS LOCOS (THE MARCH OF THE MAD MEN)/On new tasks, new forms of employment and new enterprises* – Economic Culture Foundation, Buenos Aires, 1999.