FROM FACTORIES TO SHOPS: DECONSTRUCTION OF SCIENTIFIC KNOWLEDGE WITHOUT A CLIENT[1]

SUZANA BRAGA RODRIGUES
Universidade FUMEC
Erasmus Universiteit Rotterdam – School of Management

ABSTRACT: Some arguments have been advanced in this paper that has a bearing upon re-definition of which kind of knowledge will be the focus of universities. With new technology, firms and universities are increasingly devoting to the task of changing tacit knowledge into a concrete and distinct product. It is argued that some factors such as globalization, the increasing salience of the market in organizational decisions have promoted commodification of knowledge even in universities. While globalization has worshipped innovation as the solution to upgrade the level of development of a given nation, this has also subverted the social importance of science in innovative processes. Because of the demise of basic science and the increasing external pressures universities, from now on, will tend to pay more attention to solution of problems that are assumed to impact on a country's relative

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position in competitiveness ranks. Thus the market, the State, TNCs or industry, those institutions that have been empowered by new-liberalism will have a stronger voice in defining the worth of research subjects rather than it will be a matter of academics' own discretion or choice.

Key words: Scientific Knowledge, Types of Knowledge, Innovation, Relation University-Environment, Teaching and Research.

RESUMO: No presente trabalho, foram abordados alguns argumentos que são relevantes para uma redefinição de qual tipo de conhecimento será o foco das universidades. Com novas tecnologias, empresas e universidades estarão cada vez mais se dedicando à tarefa de transformar o conhecimento tácito em um produto concreto e distinto. Argumenta-se que alguns fatores como a globalização e a crescente importância do mercado em decisões organizacionais têm promovido a transformação do conhecimento em mercadoria, até mesmo nas universidades. Enquanto a globalização idolatra as inovações como sendo a solução para o aumento do nível de desenvolvimento de uma determinada nação, ao mesmo tempo, isso negligencia a importância social da ciência nos processos inovadores. Devido ao legado da ciência básica e ao aumento de pressões externas, as universidades, de agora em diante, tendem a prestar mais atenção à solução dos problemas que comprovadamente impactam na posição do país em ranks de competitividade. Assim como o mercado, o Estado, as multinacionais ou as indústrias, as instituições que têm sido influenciadas pelo neoliberalismo terão uma voz mais forte ao definirem o mérito dos temas de pesquisa ao invés de a agenda ser uma questão de escolha ou decisão dos próprios acadêmicos.

Palavras-chave: Produção de conhecimento; conhecimento científico; missão das universidades; trabalho acadêmico.

"Promoters of instructional technology and 'distance learning" advanced with ideological bravado as well as institutional power, the momentum of human progress allegedly behind them. They had merely

to proclaim 'it is the future' to throw sceptics on the defensive and convince seasoned educators that they belonged in the dustbin of history'... 'Meanwhile, all the busy people supposedly clamouring for distance learning – who allegedly constitute the multi-billion dollar market for cyberinstruction – are curling up at night with the New York Times top best- seller, Tuesday with Morrie, a sentimental evocation of the intimate, enduring, and life-enriching relationship between a for mer student and his dying professor. 'Have you ever really had a teacher? One who saw you as raw but precious thing, a jewel that, with wisdom, could be polished to a proud shine? If you are lucky enough to find such teachers, you will always find your way back'. So much for distance learning." (Extracts from the "Digital Diploma Mills, Part III by Noble, November 1998).

Knowledge is increasingly becoming a commodity. It is a utility and also has an exchange value (MCLELLAN, 1977). It is bought, traded, codified, transferred, and even marketed like any other product. In its electronic version knowledge can be broadcast, transmitted, publicised, promoted and of course, licensed. Indeed, knowledge is not solely produced for one's own use, but it has an exchange value, fulfilling Marx' concept of commodity fetishism.

Bourdieu (1976, 1988) elaborated the idea of scientific knowledge production and its associate symbolic products some time ago. However, his discussion concerned primarily the political and normative procedures that regulated the achievement of symbolic distinctiveness like titles, academic positions, prestige and recognition. His preoccupation involved the production and reproduction of scientific knowledge and its submission to the political struggles of scholars interested in to occupying key positions in the academic hierarchy. In his view one of the reasons behind the production of scientific knowledge is the achievement of authority in a particular field. Achieving a position of monopoly over what is considered legitimate scientific competence corresponds to being 'proprietor' of a particular scientific truth and of the areas it circumscribes. It represents various symbolic distinctions

such as prestige, recognition, the right to define what is important to investigate, power to define barriers to block entrance to a particular field of science, not to say access to funds for research. If Bourdieu had written his article 'Le champ scientifique' nowadays, his concern would certainly be of a different nature. Rather than giving attention to the political dynamics of the 'champ scientifique' it should be more important to understand the logic of the market of science making and diffusion.

The present paper discusses knowledge production in organizations as opposed to knowledge production in universities. It discusses questions like: what kind of knowledge is liable to be transformed into a product and service and therefore, subject to price mechanisms? How does knowledge of management fit into this 'knowledge market' and which implications can be drawn from this discussion for the management science and the role of scholars in their universities? This paper tries to answer these questions in a rather exploratory manner by drawing up some evidences for the assumption that even scientific knowledge can become hostage to the market rules like any other product. It is also assumed that the current enthusiasm in transforming the abstract and intangible knowledge into tradable goods does not happen in a vacuum. It is encouraged by the current models of economic development that supports the concrete realisation of a broader ideology behind the concept of global competitiveness.

It is assumed that the traditional idea of self-determination in academic world as concern knowledge production and diffusion has to be seen in a much more relative way than Bourdieu's conception in the Seventies. This paper suggests that the power of academics to define the content of the knowledge created inside the institutions, which better accommodate scientific production – universities- will be increasingly reduced. Even hard sciences in which knowledge is based on more abstract, formal and controlled conditions, are becoming more influenced by perceptions and needs of different constituencies such as the State, industry and even students.

There are evidences that contradictions and dilemmas concerning the process of scientific knowledge production and control are becoming more complex. Firstly, current models of development emphasise the importance of innovation for economic development and simultaneously the demise of basic science in technical advancement. Secondly, scientific knowledge is becoming more customised and commodified. Thirdly universities traditionally seen as knowledge factories of which, much of the production was directed towards their own internal consumption are being urged to collaborate more closely with industry in order to demonstrate more unequivocally their contribution to society. Finally this paper draws some implications of this discussion for scholarship in management. If knowledge in management is becoming more commodified, what kind of consequences this will bring for the social relevance of scholarly work? In order to discuss these issues this work starts from a micro perspective by relating types of knowledge with conditions for diffusion, then it moves to the organizational and task level of analysis to depict recent changes in the university mission. Further it goes back to the micro level to understand the condition for knowledge in management production and diffusion.

THE KNOWLEDGE FAITH

In the end of this millennium we have been witnessing a major social and organizational transformation. Easier access to information due to new technology and speedy communications has created the appropriate terrain for knowledge to escape its traditional holders: small circles and the elite. Multimedia, like CD ROMS, videos, and above all, Internet has facilitated information compactness and indiscriminate distribution. In management science this development has required completely new metaphors to represent the potential and also the pretension behind this idea. Instead of being rational entities, organizations have been changed into intelligent and humanised 'creatures'.

They are capable not only of discriminating between various kinds of alternatives - as the classic economic paradigm wanted – but also of learning from their mistakes. In the "knowledge creating

company" metaphor (NONAKA and TAKEUCHI, 1995), companies learn not only through minds, but also with their bodies. Learning means adjusting identity to the new knowledge as it involves emotional commitment as well as insights and intuition. (NONAKA and TAKEUCHI, 1995) The concept of 'knowledge workers' (BELL 1973, DRUCKER, 1993), initially applied only to the service sector has now been extended to industrial workers, raising the status of labour in general (STEWART, 1997).

People with a future are those who have knowledge and know how to use it (DRUCKER 1993). These new metaphors were needed to celebrate and summarise the until then uncovered process between inputs and outputs, usually seen by the economists as a black box inside the firm: "knowledge embedded in routines and practices that the firm transforms into valuable products and services" (DAVENPORT and PRUSAK 1998: ix).

The growing importance of the knowledge trust in organizational models suggests not only, that it is an asset that can be stored, retrieved and transferred to third parties in drops counter, but that also it is increasingly possible to transform intangible knowledge into specific products. Transformation of tacit and also intangible knowledge into concrete products occurs in a context of a 'knowledge market' that allows negotiation between buyers and sellers in order to maximise utility. "The knowledge market, like any other is a system in which participants exchange a scarce unit for present or future value' (DAVENPORT and PRUSAK 1998:25).

Traditionally, knowledge has been defined as 'justified truth and belief' (DIJK 1998: 109). In other words, it has to be justified in terms of a socially accepted criterion of truth, like the formal evaluation of facts and events or presentation of data. In any case, knowledge cannot be taken as a static phenomenon or concept. There are various possibilities of changing its nature from abstract to concrete or the level of complexity and opportunities to recombine different kinds into a completely new product, activity or business (DRUCKER 1998, GALUNIC and RODAN 1998). It can also be unfolded into different categories depending on the nature of control over the process of generation and

diffusion. To some authors, data information and knowledge have different meanings (DAVENPORT and PRUSAK, 1998). Information relates to separate pieces of data whilst knowledge involves dealing with information in specific contexts (HOWELLS 1998:51). Knowledge can also be divided into explicit and tacit. The explicit is codified and can be transmissible in terms of direct experience like in a manual of instructions. Tacit knowledge is viewed as the one that is not easily codified in the sense that it is internalised by the individual, and not easily transferred to others (DIJK 1998, HOWELLS 1998). It cannot be codified into artifacts neither can it be communicated directly (POLANYI 1967).

NONAKA and TAKEUCHI (1995) argue that the skill to learn tacit knowledge is what distinguishes Japanese from western companies. Tacit knowledge is 'deeply rooted in an individual's action and experience as well as ideals, values or emotions he or she embraces' (NONAKA and TAKEUCHI 1995:8). This type of knowledge cannot efficiently be diffused through indirect means, like lectures, or books but requires personal communication and interaction.

In many instances knowledge has been confused with technology and vice- versa. Technology is seen as the knowledge that underlies artifacts and the way they are used by society (RUSSELL, 1997) Knowledge, on the other hand, is conceived as that information which fulfils human needs in a specifiable and reproducible way (SKOLNIKOFF, 1993). It is altern atively defined in terms of expertise in various fields, as the outcome of learning, which involves the acquisition of information and specialist understanding (RUSSELL, 1997) or, as a reflection of 'action focused on results' (DRUCKER, 1993:42). The concept of technology is usually attached to industrial capacity. While technology has usually been seen as separate from the knowledge holder as a stand-alone product, knowledge is viewed as embodied in the technology and occasionally inseparable from its holder.

Software, is a stand alone technology, while human skills, professional services and management techniques like total quality, marketing and production are usually associated to a knowledge holder.

Boisot (1995) has intuitively made a distinction amongst these various types of knowledge depending on how easy it can be codified and diffused. For example common-sense knowledge is uncodified and diffused and it can be only be gradually acquired through face to face interaction. But it opposes proprietary knowledge that is highly codified and is not liable to wide diffusion. Personal knowledge and public knowledge – oppose each other as the first is uncodified and little diffused - and the latter, codified and diffused. According to the author, 'public knowledge is what most closely corresponds to 'knowledge in society'. 'It is structured, tested, recorded in textbooks, learned from journals, and other publications' (BOISOT, 1995:146). In general, the data it concerns is codified; its content therefore can be highly diffused and become of public domain. Usually it does not involve face to face interaction, as it is available by formal and public vehicles. Common sense knowledge on the other hand is acquired more slowly than the public type. It is more dependent on the person that holds it and is linked to a particular situation. It is more contingent and context dependent in the sense that it cannot be separated from the cultural and social system that nurtures it. Thus it is restricted to a particular group and it depends on interpersonal relationships in order to be shared. Personal knowledge is idiosyncratic, hard to communicate, more difficult to transfer and transmit whereas the proprietary is the personal that can be transformed into an intelligible and articulate experience. This kind of knowledge cannot be easily appropriated by others as it has a utility value attached, so it can only be traded or bargained (BOISOT 1995).

Figure 1. Types of scientific knowledge

CODIFIED	(1) Invention Innovation	(2) Product Development
UNCODIFIED	(3) Basic Science	(4) Applied Sciences
	Restricted Diffusion	Mass Diffusion

Adapted from Boisot 1995: 146

If these concepts are applied to scientific knowledge some possibilities of diffusion could be envisaged according to the level of complexity and codification. For example, as shown in Figure 1, basic science is difficult to codify except by the experts in the research area who are familiar with the methods that codifies tacit knowledge. As basic science implies individual, subjective and abstract knowledge, its accumulation does not eventually occur but depends on the individual career trajectory.

In this case, learning can only be transferred face to face, through continuing contact of one individual with another. Likewise, theory develops within small groups in a context of controlled interaction. Applied science is as uncodified as basic science and its knowledge is also linked to the individual trajectory of the researcher. Because the knowledge it involves is less specific and more linked to problem solving, its principles are liable to be understood by practitioners and users as soon as it is codified. This allows its diffusion to a wider audience. Invention consists of the creation of new coding while innovation involves taking on board an invention and transforming it into a new idea. An innovation is fulfilled only when it acquires commercial value (FREEMAN and SOETE 1997). It is

the scarcity combined with its utility is what provides it with an economic value. In the proprietary knowledge, innovation is codified and its diffusion restricted (BOISOT 1995). A problem for the knowledge holder is how to protect diffusion and ultimately how property rights might be sustained (CHILD and HEAVENS 1998). Product development is an activity that concerns improvements in goods, but may begin with inputs from practical problems, that can have as a consequence, blueprints and specifications for new products and an improved process (FREEMAN and SOETE 1997). By reducing the complexity of forms and content and establishing clear relations between discrete elements, product development achieves a level of codification that allows mass diffusion.

Though products can be mass diffused and used by a larger audience, only experts can understand the principles used in its makings. Innovation has been associated with creation of new wealth (SCHUMPETER 1934, DRUCKER 1998) or with recombination of resources-based knowledge in a way that it creates a resource with a new value added (GALUNIC and RODAN 1998). There are different kinds of innovation in terms of the degree of novelty. The most important is the 'new knowledge innovation', which implies social, technical or scientific changes (DRUCKER 1998). Usually this type of innovation takes longer to emerge either because it involves knowledge of a different nature or because its utility is not immediately clear. To be successful that innovation must be transformed into a solution of widespread use like the post-it or the MacDonalds' services where tacitness is routinised standardised and therefore, licensed. Thus innovation may also imply an administrative solution that becomes technical because it is likely to be codified and diffused in a controlled way.

Conventional academic activity relates to codifying uncodified abstract and complex knowledge in a way that its principles become accessible, and therefore can be passed universally on to others. The way in which knowledge is dealt with and idealised nowadays, however, transcends the makings of one nation or of a particular agent. The relevance of knowledge in society started to change with the

increasing structuring of expertise into professions and occupations that happened in the beginning of this century and with the growing importance of the service industry nowadays (PERKIN 1996).

Recently, the capacity of a nation to transform intangible knowledge into innovation and products has been the main parameter of competitiveness among nations and has been taken as an indication of the degree of development of a country.

INNOVATION AND MODELS OF DEVELOPMENT

Anything that is at the top of any government's agendas or is the object of economic models becomes a panacea, fetishism or at least a fad. In recent years it has been widely accepted that technology is the key resource that reduces the differences among more and less advanced nations.

Innovation is now understood as being central to industry strategy, one of the most important factors in industrial competitiveness (PORTER 1986) and is also seen as decisive to the competitiveness of nations (PORTER 1990). Porter adds that the association of invention with entrepreneurship creates a national comparative advantage that permits the former to be exploited internationally and prevents its appropriation by others. Current theories of economic development consider invention, innovation and technology central to economic growth. Technology promotes growth as it increases productivity, enables introduction of products with value added, and improves exports by the inclusion of technology intensive products. (ARTIBUGI and MITCHIE 1998, UNITED NATIONS 1992, NELSON 1993). As Farrand (1997) among others has argued the process of knowledge diffusion which involves know how, skills, patents and licenses more than machines, is viewed as essential to the capacity of firms to compete globally. Knowledge structures and diffusion have had a significant impact on the direction and speed of globalisation process.

Models of economic development based on development of innovative and technology capacities are well integrated with competitiveness discourses. The notions of competitiveness on their turn are deep-seated of the ideas of neo-liberalismand neo classical macroeconomics (LUCAS 1987). By definition competitiveness is achieved by compliance with principles of neo-liberalism. Competitiveness has been defined as 'the ability of a national economy to achieve sustained high rates of economic growth' (SACHS and STONE 1997:x) where suitable policies stand for the opening of national economies to international trade and finance, privatisation, low inflation and improved infrastructure. It is a model that co-operates with TNCs strategies of expansion in international markets as it is anchored in the idea of opening barriers to trade, which creates a propitious terrain for multinational expansion. Transnational corporations have indeed reached an unprecedented power (MOKIHIBER and WEISSMAN 1998) because they have had governments and small organizations on their side as mediators of their expansionist strategies and because neo liberalism provides rational justification for their policies and activities. Small wander that acquisitions of national companies by TNCs are multiplying all over the world (CHILD et al. 1998).

Neo liberalism has achieved a very impressive homogeneity in the last few years. Its homogeneity has been achieved by means of integrating discourses of strategies of international institutions like the IMF, the World Bank, the United Nations and the World Economic Forum. An important agent of this ideology has been the IMF whose ideas of development such as reduction of the State, restraining inflation, and technological improvements correspond closely to the notions of competitiveness which have been introduced by the World Economic Forum. Thus, the pervasiveness of this idea of development can be detected in various levels of society. The efficacy of globalization seems to be achieved through the co-operation of governments, by the action of Ministries of Economy and Labour that frequently intermediate interests of international bodies, and of TNCs with those of national economies (COX and SINCLAIR 1996).

Then, the homogenisation of the competitiveness discourse goes through different layers of society from international bodies to governmental institutions and from there to organisations. This does not mean linearity of course! The international bodies do not draw their influence only from their direct contact with government officials. They have various other means of persuasion such as the international reports and conferences. The kind of language they use and the audience they reach is crucial. The arguments and alternatives suggested by scientific reports like the 1995 World Investment Report (UNITED NATIONS 1995) about the benefits brought about by transnational corporations to emerging economies are unequivocally impressive. Not only because it is overloaded with data, but also because it reaches the elite of countries (academics, business executives, government officials and bureaucrats). The scientific language and the apparent frontier knowledge they carry - diagnosis of the behaviour of the main economic and political agents in the world, and predictions of international finances and commerce - can be a very powerful instrument of persuasion. Thus, international bodies put forward arguments that can, at a later stage, be taken for granted by economists, financial agents, managers and researchers.

It is not new, the notion that ideas vested with rationality – based on theories and data – carry with them the needed legitimacy to change behaviour patterns (BURRIS, 1989). The free market discourse focuses on the internal level of the economy, on the advantages and on the need to change the relationships between the firms, markets and the state. The new international order involves the reduction of government interference on market transactions by formalisation and rules so as to permit more players by relaxing barriers of entry. Management 'gurus' have co-operated with these ideas by re-furbishing and inventing new metaphors such as learning organizations, re-engineering, outsourcing and, high performance systems - which have fitted well within the current economic context. These new models have been promptly adopted by transnational corporations, transmission belts of management ideas to the world par excellence (BARNET and MÜLLER, 1975).

Thus, models of development do not exist in a vacuum, they usually integrate macro discourses with institutions in any given society (BIGGART and GUILLEN 1999). They can be successful if they are introduced in a particular momentum of history, when opposing forces are dormant and cultural conditions co-operate. For example, recent changes in values and behaviour in society that have been happening in the end of this century seem to fit well with the neo liberal ideology. Social and economic transactions are becoming more pragmatic and more utilitarian and so are relationships.

Governments are encouraging citizens to become more competitive, more orientated towards grasping new opportunities and improving gains. The idea implicit in the 'enterprise culture' of the neo - liberal British government has been defined as 'competition and consumer led' as it spurs competition by public and non-profit organizations to private ones. According the conservative government "producers should take the initiative by always being alert for opportunities: in particular, those provided by new consumer requirements" (HEELAS and MORRIS 1992: 3). The idea of enterprise culture by the British government implied pushing individuals to take opportunities and not be afraid of risks. Hayek (1960) and Friedman (1969) leaders of liberalism and neo liberalism respectively argue that people should achieve well being by striving to maximise their own advantage, by inventing and promoting new projects which could be achieved by rational calculations, including reducing costs.

Thus, the model of economic development with its ancillary conceptions of competitiveness and technological fetishism suits the ideal of the rational man in Economics. For the neo-classic economic theory, self-interest is the stimulus that motivates human behaviour. Economic suppliers are profit or income maximisers and consumers are utility maximisers. The notion of the economic man incorporates both, because of the intentions to maximise profit and utility simultaneously. Nevertheless, what this paper wanted to call attention to, is the growing pervasiveness of the logic of utility maximisation in knowledge production and transformation and, its embeddedness in current models of economic development.

TRANSNATIONAL CORPORATIONS AND INNOVATION

Until recently it was widely believed that scientific innovation and discoveries were carried out in universities and research laboratories. Some mechanisms to promote integration between university knowledge and these laboratories have been devised, like science parks that are supposed to provide market and managerial skills. The effectiveness of this model has now been frequently contested (KEALEY 1997, KLINE and ROSENBERg 1986, NELSON 1993). Science is no longer viewed as important, partly due to the uncertain nature of its results in the sense that researchers do not know exactly who will benefit from their outcomes and when (FREEMAN and SOETE 1997).

Considering the current ideas of economic development, it is not surprising that the centrality of technology coincides with the demise of the social and economic importance of basic science. It has been recently recognised that the university is not the institution, which is best equipped to do undertake responsibility for innovation activities. Reliance on the kind of knowledge that is produced in universities has not led to routinization of innovation as expected. It is now increasingly recognised that Research and Development (R&D) systems, that link university scientists and company engineers

in any given project and the quality of interaction between these agents are the key conditions for promoting the kind of research and development that leads to technical advance. On the other hand, there seems to be a conflict between science's ethos and the need to keep the principles of this invention secret until it can be recognised a novelty by national and international patent registering bodies. Generally, neither the university nor the inventor is prepared to take the risks involved in property registering. But transnational corporations are.

Transnational corporations (TNCs) are the entities that have been investing more heavily in research and development. TNC concentrate 80% of all global and civilian R&D expenditure. (DUNNING 1993). The largest transnational firms account for approximately half of the world's patents (UNITED

NATIONS 1996). TNCs are perceived as better equipped for innovations. First because they are able to change tacit knowledge into technology, by attracting the best scientists and technicians in the world. Second, because they have the necessary market skills to transform innovations into products and, the economies of such widespread scale and scope so as to commercialise it globally. Because of their presumed importance in development, particularly due to their ability to create value added products and improve a country's export profile, transnationals are now viewed as the world's main 'engines of growth' (UNITED NATIONS 1992). They are therefore, able not only to create knowledge that is liable to turn into innovation, but have the capacity to maintain access to it under control in order to create added value. Patent registering is crucial for transnationals' expansion as it permits licensing and other forms of international alliances. But knowing how to register a patent requires tacit knowledge itself. Though commercialisation of invention and patents seem related processes, they in fact involve quite different processes with various degrees of difficulty and risk (PITKETHLY 1997). Patent registering is a long muddling process that involves a great deal of uncertainty and risk concerning its present and future outcomes. Pitikethly compares it to a lottery game that involves a "complex series of possibilities each involving costs and actual benefits or potential future benefits..." (PITKETHLY 1997:2). Universities are in general, prepared for neither of them.

BASIC SCIENCE OR INNOVATION?

Various studies recognise the importance of basic science in the innovation process (BOYLE et al. 1984; FREEMAN and SOETE 1997) although the dependence of innovation from the former is now being questioned by government officials, international institutions (UNITED NATIONS 1992) and even by researchers (NELSON 1993, BOYER 1990, MOWERY and ROSEMBERG 1995). As mentioned, until recently, basic research, usually a responsibility of universities, was seen as an

important part of the network involving innovation and product development. Underlying these ideas is the notion that technical innovations result from the application of new scientific insights and ideas.

This model is described as linear since it assumes that first, scientists make discoveries, then technologists exploit the new knowledge, and finally the manufacturer develops new products (BOYLE et al 1984, YEARLEY 1988 and DAVID 1997). Now it has been realised that the relationship between science and technology development is looser than initially thought. Instead, a more detailed look into the history of industrial development suggests that various innovations did not proceed from scientific inquiry (NELSON 1993, FREEMAN and SOETE 1997, MOWERY and ROSEMBERG 1995). More precisely, the work of various scientists had received the input of practical solutions and methods previously developed by the technologist. What they did mostly was to organize and re-structure knowledge already developed, changing it into a more systematised and formal format.

In addition, the emphasis on R&D systems also tends to reduce the social relevance of basic sciences and of the university in the process of technological development. One of the reasons has to do with the fact that success of technical change is attributed to the R&D system as a whole (GALAMBOS and SEWELL 1995). In this model, universities only play a partial role in development (NELSON 1993). Students of R&D systems argue that various agents like scientists and engineers linked to business firms, universities or government agencies constitute the key vehicles for technical change and technological advancement (NELSON 1993; REID and GARNSEY 1996).

For many years the importance of basic science in innovations went almost unchallenged until recently with the publication of Terence Kealey's book The Economic Laws of Scientific Research in which he demolishes the view that basic science is important for technical advances. The author defends the idea that the market economy principle should be applied to basic research funding, which is affordable only by rich countries. By financing inefficient institutions, governments punish innovation initiatives instead of rewarding them. Basic research should definitely be banned from government priorities

given that greater scientific understanding follows from improved technological practices rather than is consequential to building a foundation for them.

Kealey's book has been as much eulogised as it has been contested. It has found support not only in the British press, like the Economist (1996) and the Daily Telegraph, but also amongst some academics that welcomed an attack on the legitimacy of public funding for research in natural sciences and engineering, as pointed out by David (1997). Much of the dispute around the arguments in this book concerns how far economic growth in advanced societies can be associated to scientific research.

In Kealey's view, the market is the main spur of innovation that creates the stimuli for deeper inquires. In contrast with the traditional view, this model works backwards whereby innovation helps the discovery of new scientific principles. Kealey's arguments have been thoroughly deconstructed by others like David (1997) and Palfreyman (1997) that conceive the relationships between science and innovation as dynamic instead of a one-way flow. The process of interaction between basic science and innovation is recursive and circular, and the effect upon economic growth can be really understood only by using a long-term basis.

The contention if basic science is important to innovation and therefore to economic growth has already been mentioned in earlier works. Yearley (1988) discusses various works that attempted to cover the relationship between basic science and innovation. Evidences pointed out in different directions. A research sponsored by the US Department of Defence (MOWERY and ROSENBERG 1995) concluded that only a small number of innovations in the weapons systems were deemed to have been scientific as opposed to technical. Most innovations had not been derived from basic scientific research.

On the other hand another a project commissioned by the US National Science Foundation on non-medical and non-military research has discovered that the majority of innovations analysed has been

derived from basic research performed by universities and colleges. Yearley argues that it is possible to conclude in favour of both sides depending on the methods and on the starting assumptions. If there is a long delay before a new technical product can be devised and if they are small-scale innovations, usually they are not associated to science, but larger scale innovations are commonly linked to developments in scientific knowledge. It is misleading anyhow to analyse the effects of science leaning primarily on the linear model. The relationships between science-based knowledge and technology are non-linear and indirect. Scientific publications and the contact among scientists, together with their role in forming qualified people that will later create inventions, places this question beyond scientific merit only. Problems and findings that originate in universities and in industry feed into the entire scientific environment (NELSON 1993, TALALAY et al.1997), what reinforces both arguments that a new body of scientific knowledge gives rise to new technologies and vice-versa.

In fact if scientific discoveries are evaluated in terms of their long term impacts, the argument of neo-liberalism that basic science is irrelevant to economic growth or, that technology (and particularly high technology) is most frequently science free, is indeed very weak. It is like using a single yardstick to measure different things. It may be reasonable to evaluate the effectiveness of technology by its ability to deliver practical solutions to concrete problems. It is totally misleading to apply the same rationale to evaluate basic science. It aims to advance knowledge and not to solve problems. It may be enough to remember that microelectronics, those gadgets that are part of our daily life, would not exist without Einstein's theory of relativity. In 1953 when Watson and Crick figured out the structure of deoxyribonucleic acid, DNA, they announced "we have found the secret of life".

The millions of practical uses of their discovery (for better or worse), were not their aim, but could not have been possible without their interest and curiosity to discover " the secret of life". Thus the view that led some investigators in this area to suggest that basic research is a way of consuming wealth

rather than of creating it contributes more to undervalue the scientific enterprise than to acknowledge it is a reliable scientific finding itself.

If on the one hand the scientific enterprise is witnessing its importance waning because of the argument by some publications about its lack of connections with practice and lack of economic relevance, it is also striking that this is happening simultaneously with the greater customisation and commodification of knowledge in universities.

CONSTRUCTING THE IDEAL OF CUSTOMISED KNOWLEDGE

Consumerism has been seen by many as a condition of post-modern societies. Until recently the image of the modern man was associated to the 'factory men' (INKELES and SMITH 1974) and ideal behaviour to the protestant work ethics in which hard work was to be compensated by continuation of employment and rise in wages. The image of the modern citizen as a producer has now been replaced by the consumer ideal (ROSE 1989, CAMPBELL 1987). The notion of consumer society hallmarks a major shift in which consumption has changed from being a mere reflection of production to being central to production. Individuals are now urged to shape their lives according to their purchasing power.

Recognition of the importance of consumerism in current society has provoked a major shift in economic theories, which used to associate consumer behaviour to utility maximisation. The notion of consumption has shifted to incorporate a larger socio-cultural significance as it is now viewed in terms of the meanings individuals attribute to things (CAMPBELL 1987). The view that consumption occupies a central space in an individual's life has contributed to a change in the attitudes concerning the customer/client; rather than seeing them as adversaries, the new culture tends to view them as assets that can be exchanged and even become more valuable (STEWART 1997).

The understanding that consumerism is part of the modern individual ideal has been an important step to raising the status of customers/clients in the strategy of organizations. But it was the liberalisation of markets together with establishing barriers to trade, on the basis of employment of total quality methods and ISO patterns that enforced the conditions, that changed the approach of organizations concerning the role of customers. The term customisation as it is used here points not only to the increasing importance of the customer in the organization strategy, but also the way in which internal and external practices are mediated through the perception, meanings and images coming from the client.

This paper assumes that knowledge, even in the cases in which its nature is most abstract and intangible, is not exempt from market rules. The knowledge markets are moved by the interaction amongst three main actors: the customers, sellers and brokers that facilitate connections between them (DAVENPORT and PRUSAK 1998). A customised knowledge implies that it is planned especially for a given client. The customer defines the content of the problem, and also influences the terms of performance evaluation. In mass production, knowledge is mostly determined by the producer and is condensed into packages and popularised for large, mostly undifferentiated constituencies. Flexible production allows adjustment of production to the imperatives of the demand and wishes of customers (RUIGROK and TULDER 1995).

The way universities deal with knowledge is also changing; while firms circulate more widely information, and have learned to value intellectual capital, universities are becoming more sensible to extenal pressures. The pressure for the university knowledge to be more adjusted and transferred to industry becomes evident by the noticeable diversification in the co-operation arrangements between universities and industry. Different forms of strategic alliances with industry are being developed, either through science parks, innovation centres or through programmes that encourage inter-university and international co-operation between universities and firms such as the Bolivar and the Pegasus

programmes. Collaboration between medical, chemical and biological sciences with large pharmaceutical laboratories is not new and neither is that between engineering and defence (NELSON 1993). Undoubtedly co-operation with industry became more formalised and legitimised when universities started to accommodate science parks in their campi. This was stimulated by the successful experience of the American universities with Silicon Valley and Boston Route 128, in exploiting commercially innovative technology and also from the perceived need to encourage commercialisation of science. Though co-operation with industry has been part of university practice in the U.K. for many years, there is empirical evidence showing that technology learning through science parks has not been very encouraging with a few exceptions (REID and GARNSEY 1996). Conversely, there are evidences that the US system of integrating science parks with university research has been highly effective in transforming brainpower into commercial innovation (DORE 1998).

COMMODIFICATION OF SCIENTIFIC KNOWLEDGE

As commented earlier in this paper, the realisation that knowledge, ideas and intelligence can be transformed into concrete products and then have a utility value attached to them has transformed the way they are viewed and dealt with by organizations. The strategic value of these assets is commemorated not only within the confines of private organizations but it is re-affirmed in various management handbooks and recipes. Organizations as learning systems are urged to detect manifestations of intelligence and change them into commodities.

The notion behind commodification is not new and is indeed very complex. It was first used by Marx to describe the logic of capitalism and its expansion. The concept was therewith to represent the process of transformation of goods into money capital, and change of labour power into abstract labour. These two processes constitute the core of what the capitalist system consists of. The capitalist regime has survived out of pursuing profit by producing goods for sale in the market. These goods are not

used for the buyer's sole use, but they represent profits that create the impetus, which permit capitalism chromic expansion. By acquiring a utility and exchange value, labour also becomes merchandise (GIDDENS 1985). In capitalism, labour is detached from its features and separated from the worker characteristics thus becoming a commodity like any other product, this allowing a better integration with technology.

It has also been mentioned in the beginning of this paper that knowledge is increasingly becoming a commodity. It is more feasible, today, to transform tacit knowledge into a product thanks to new technology. But as a consequence, knowledge production becomes more subject to market rules, more liable to be controlled by supply and demand and therefore, it needs the symbolic embellishments to be turned into an attractive product. The question, which this statement immediately poses is, has knowledge production not been under capitalist rules for a long time already?

The answer is affirmative, of course. Nothing is new to date. However, there are some recent facts, which have called the attention of this author. New technologies possess some characteristics that facilitate transformation of tacit knowledge into products and then, into commodities. In this process some symbolic characteristics are added so as to change a particular item into a marketable product. Recent technologies have the capacity to preserve some of the tacit characteristic of the knowledge producer, at the same time that they allow diffusion not only too large numbers of people but also at a distance. Thus, they are capable to maintain the specific-context characteristics of the producer, at the same time that they allow a level of de-contextualization that permits its diffusion to very differentiated markets. An example includes cable TV and courseware through CD ROMS.

As mentioned, universities are seeing public funds reducing and therefore are being forced into the market place and become more profit oriented. They have become more strategically involved with packaging courses into distance learning programmes and other media for exploitation of third parties

that are allowed to transmit, promote merchandise, license, market and reproduce material created by their staff (NOBLE 1998).

KNOWLEDGE FACTORIES OR INNOVATION FACTORIES?

Democratisation of knowledge has been seen as the main strength of an institution by tradition known as a 'knowledge factory': the university (The Economist 1997) . Judging by the new metaphors in use, universities can now treat companies as their 'underestimated' rivals to be. Conversely, companies have been defined not only as knowledge repositors but they have also been given responsibility for creating and managing intellectual capital (Stewart 1997). The number of corporate universities in the world is growing steadily (MOWDAY 1997) as is growing the number of enterprises that are assuming responsibilities earlier attributed to universities or to the State. One example is FIAT car manufacturer in Brazil that was given responsibility to co-ordinate a major project to improve the competitiveness of Minas Gerais State in this country. Thus, it is not surprising to find out that universities have been called 'digital diploma mills' (NOBLE 1998) to indicate their recent taste for inventing and commercialising new products and services such as distancing learning through videos and internet services. It seems therefore that the clear divide, which existed between functions and domains of research institutions and firms, is not any longer as clear-cut as it used to be.

Universities are one of the most ancient institutions in the world; some are older than state nations. In the West universities have survived wars and change of governments, in part because of their capacity to adapt themselves, in part because of their acknowledged importance in society and more recently, due to their presumed power to contribute to a country's performance and development.

The university has grown substantially in the twentieth century at first because of the role of science in war and recently, because of the growing importance of knowledge in economies and society. Though

most are not entirely aware, universities may be on the verge of a major transformation in the way knowledge is used and managed internally.

Though universities are one of the most enduring institutions and have proved their importance to society throughout their long history, their capacity to contribute more directly to economic growth has been put to test. Governments of various countries and also university administrations have shown their disappointment regarding their capacity to respond more effectively to the needs of modern society and economy. Despite their institutional importance one major problem that preoccupies governments is their capacity to contribute more clearly to solve problems of development in emerging economies and of sustained competitiveness in the developed countries (MOWDAY 1997, PORTER and MCKIBBEN 1988, LUCAS 1998).

As mentioned, the neo liberal model of economic development considers a country's capacity to develop new technologies as a thermometer of economic development as well as a propeller for growth. Concerns with the university capacity to contribute to this technical development have been questioned mostly by liberalism symphatizers such as the magazine 'The Economist'. Universities have been challenged by this publication a few times, but the most astonishing evidence can be found in a survey about universities published in October 4th 1997. This report suggests that most universities around the world fail to meet society expectations, one of the reasons being their inner rather than external orientation.

Although this matter cannot be taken as an indicator of public opinion about the performance of universities it should not be considered be trivial, since it represents the view of neo-liberalism. It is not sensible either to neglect the fact that there is a great deal of concern about the current crisis in universities (LUCAS 1998, GLASSICK et al. 1997, EHRENBERG 1997). Disappointment regarding the university role and function has been expressed in various fronts. If, however, credit should be given to democratisation of the university due to the strategy of including a greater number of students

on the other hand, there is controversy about its mission (LUCAS 1998). Criticisms revolve around introspection, egocentrism and inner orientation in terms of performance evaluation. Academics worry primarily about evaluation by their peers and do not concern themselves with external opinion. (LUCAS 1998). In fact most criticism usually come from the university administration that criticises what Bourdieu (1988) defined as orientation towards building intellectual capital against the need to provide more attention and support to the demands of technological innovation. Criticism is also concerned with lack of attention to students as opposed to papers (GLASSICK et al. 1997, LUCAS 1998). The call for universities' collaboration in dealing with problems of society involves not only keeping up with changes but also, facilitating them.

But it is also evident that the neo liberalism discourse expresses its preferences for what universities should define as being their principal mission. It does not take too much effort to understand the neo-liberal view about universities. They should undoubtedly be cost and outer-orientated, this bearing upon the academic tradition of defining its activities according to the rules of the institution as Bourdieu (1976, 1988) has pointed out. Inner orientation fit neither pragmatism/immediatism nor 'customer' orientation. The discourses about the university performance carry various ambiguities, reflecting the contradictions in the neo liberalism discourse itself. It has been mentioned already that liberalism associates the seen importance of universities to their eventual contribution to the discovery of new technologies not to their unquestionable role in technical advancement. I have also referred to the fact that basic science has been dismissed in favour of innovation, either because its results are not immediately evident to governments eager to implement their plans, or because it requires long term investments. But, universities are perceived as failing anyway, as they usually elect other priorities than innovation. As the neo-liberalism order imply cost cuts, scholars need to diversify their interests by devoting themselves to activities such as teaching and applied research in order to be able to respond more appropriately to the needs of the clientele being it students, industry or society in general.

Though some of the criticisms pointed out here need serious treatment, they are frequently loaded with exaggeration and contradiction. For example, it has also been widely mentioned that the comparative advantage of the US has come from its capacity to attract 'brains' from all over the world. The university system is seen as the principal responsible for it, as it provides adequate structure and motivation for research activities and career. In contrast with the Japanese educational system, bright students in the U.S. go first for a graduate training or position before they engage in innovating activities. The Japanese are said to lag behind the Americans because they lack this kind of structure. Instead of proceeding with their studies towards a post-graduate level, they go straight to corporate labs and therefore cannot benefit from the atmosphere of creativity and freedom that universities provide (DORE 1998).

Independently of the fact that there is some truth in the inconsistencies of what the universities and other people perceive as being their main mission, it is also evident that there is a conflict in the process of knowledge generation and diffusion. The first requires introspection and inner orientation and the second an outerward looking attitude. Earlier studies of the university have compared it with a 'garbage can' to represent a decentralised chaotic system whose goals were unclear and changing.

Other studies have also revealed some particularities of universities. Faculty members are more orientated towards the institutional rules linked to their disciplinary field than to the university rule. They show more respect for the hierarchy in their own 'scientific champ' than to the bureaucratic one in the university (BALDRIDGE 1971, RODRIGUES and HICKSON 1995). In this sense, the faculty is more concerned with evaluation by their peers than they mind administration evaluation. As Bourdieu (1976,1988) pointed out control over academic performance lay inside the academic hierarchy that has their own rules of classification and positioning of members. Criteria for evaluation are predominantly internal and socially constructed.

It seems therefore, that it is impossible to locate precisely where the pressures for change come from. However, it is apparent that we are witnessing a breakdown of the relationships between government and the academic world (EHRENBERG 1997). In any case the university response is not free of contradictions either as some of the criticisms come from the academics themselves. Moreover, they must not be understood as innocent victims of neo-liberalism. It is argued that as a result of globalisation, universities have adopted commercial ethos and the faculty, which traditionally sat in the side of labour, has now positioned itself in the marketplace (SLAUGHTER and LESLIE 1997). Noble (1998) reveals that universities, which have traditionally orientated their mission towards contribution to mankind are now seeking eagerly maximisation of utility, not only in research but also in teaching by creating profitable alternatives through electronic means. Various universities are now commercialising their instructional activities by converting instructional material into CD-ROM's, web sites, cable TV and electronic courses. This tendency, Noble points out can in fact bring wealth as a result of the development of new technologies, but it 'has irreversibly corrupted the university as a site of reliably independent thought and disinterested inquiry' (NOBLE 1998:1).

INSTITUTION-LED OR MARKET-LED: IMPLICATIONS FOR THE AUTONOMY OF ACADEMIC WORK

Various implications can be drawn concerning the increasing commodification of scientific knowledge and the concomitant re-orientation of the university's policy. One first issue concerns the context of knowledge production and performance assessment in universities. Second, it is likely that the relationships between academics and the university administration will change with the administration having more control over the strategic dimensions of academics task responsibility.

Regarding the first issue, if predictions of Marxist theory are taken into account, and if we consider that liberalism policies have withdrawn many of the barriers that prevented capitalism from actualising its full expansion, it can be assumed that, commodification might reach other tacit knowledge - not yet

subject to commodification. Academic labour would also be liable to become commodified as a result of the commercialisation of science. By using methods that result in its consolidation as abstract – disembodied from individualities and identities – academic labour becomes more malleable to management control (GIDDENS 1985).

Two factors can influence this hypothesis nevertheless. Because of the tacitness implied in scientific knowledge, it is naturally difficult to appropriate it. However, new technologies make it possible its transformation to the point of making automation feasible through mass production. As it is changed into a commodity, scientific knowledge becomes more influenced by the dynamics of markets, which nevertheless differs from that of institutions. Markets are open-ended social spaces subject to spontaneous movements of producers, consumers, owners, workers and governments (BOYER and DRACHE 1996). Knowledge products become therefore subject to the dynamics of supply and demand that has an interactive relation with price. This implies more ambiguity and uncertainty in the process of defining academics responsibility and criteria for performance evaluation.

Scientific knowledge presents distinctive characteristics. It is organized around abstract, formal structures developed in laboratories or through research. I am talking here essentially about tacit knowledge that is personal and context-specific, where the producers enjoy high autonomy in the selection of its content and of the methods of obtaining and converting it into the explicit type. By tradition the selection of what is important to investigate and methods of diffusion has reasonably remained in the hands of the producers themselves: the academics. In terms of science production and diffusion, the definition of what should be investigated and taught, with exception of the applied sciences, has never had too much influence, either from the university administration or from external constituencies, such as the students, practitioners, government or industry. However, it is also true that scientific knowledge generated and diffused by universities has never been fully autonomous in the

sense that syllabuses contents and the definition of professional skills and evaluation have to be shared with other agents in society like the State or employers and professional groups (WHITLEY 1995).

Moreover, the autonomy of academics to define their responsibilities (research topic and methods of evaluation of their own performances) can be more or less satisfactory. The degree of autonomy will depend on the kind of problems it addresses: if more concrete or abstract in nature, on the extent to which the profession is institutionalised and if that university training is recognised as important by society (WHITLEY 1995). When the nature of knowledge is concrete in a context where professional institutionalisation is low, if university training is not recognised as being important, and if there is high demand for enrolment, academic autonomy can be reasonable but could still be influenced by pressures from practitioners (WHITLEY 1995). In general the more a field of knowledge is grounded on research activities, and the more it is based on formal abstract knowledge, the more the academics are able to define the contents of their task and to lay dawn the rules for their own performance evaluation.

In the case of hard sciences, in which concepts are more abstract and detached from practical issues, academic autonomy is less likely to be affected by external constituencies and professional institutions. As they do not depend on external constituencies for recognition, their choices are shaped by internal criteria such as prestige, legitimacy and authority in the field of expertise (WHITLEY 1995).

Second, property rights and copyrights are increasingly becoming a legitimate practice. International bodies like the World Trade Organization have put forward pressures for conformity to intellectual and industrial property rights world-wide. One of the consequences is the increasing importance now given to patents not only by private organizations but also by universities and academics. As a result, more frequent and new forms of co-operation between universities and industry are arising with the effect of turning universities more accountable to the needs of the economy than in the past. That also means that the culture of universities will change, irrespectively of the area of knowledge so as to incorporate more closely the needs of the market and also of society.

If more types of scientific knowledge can be disembodied from owners and transformed into a product of some kind, then one would expect a complete transformation of universities and of academic undertakings. To avoid the eventual opportunism that a weak institutional arrangement would incite, universities as organizational systems, would have to act as mediators between the market and inventors of knowledge commodities. Though enhancement of control by the university administration would appear inevitable, but undesirable, this hypothesis cannot simply be considered an exercise of imagination. Noble (1998) has warned that American universities are adopting a rather commercial culture 'by devoting to converting intellectual processes of research into discrete products – inventions – and inventions into commodities – things that could be owned and exchanged in the market by means of property rights registering'. Though patents are not a new development at all, we have witnessed recently a wider recognition of their strategic value for organizations. But that is not all. What is different from a decade ago is the greater importance of the market as opposed to institutions on the one side, and on the other the availability of new technology that makes possible transforming intangible knowledge into single products. Although American research universities are well acquainted with the innovation process and registering, most universities in the world are not.

Innovation can easily lose its value as such if scientists do not protect its novelty by following the national and international laws of property registering. Though most country members of the WTO have to comply with determinations of the international patent law, registering is a process that varies from country to country. In contrast with the U.S., in some countries an invention loses its value as novelty if the researcher publishes a paper or defends a thesis before registering. Thus, those who do not understand the tacit knowledge involved in the process of keeping innovation secret and of controlling diffusion run the risk of having that invention appropriated by others more powerful. Yet, even in America there are various unresolved conflicts concerning property rights registering. While the American Constitution protects the rights of inventors, universities are converting the property

rights of the faculty by means of including in their contract arrangements that transfer the rights to the institution, which in turn concede inventors participation in the revenues (NOBLE 1998).

The question of property rights is not limited to inventions only as it also involves copyright of on-line courses. The conflict that this poses is that once inventors rights have been already established and for malised constitutionally, by changing the rules of the contract, university administration shift economic rules into an ethical and a moral issue. If the rights belonged to the author, according to established practices, it becomes difficult for the administration to change rules without incurring political costs (NOBLE 1998). Moreover, the question of property rights control cannot be understood separately from its impact on the key professional dimension of the academic profession, such as autonomy, control over use of materials not to mention the impact that this content will have over the quality of education. Various contracts of commercialisation of knowledge include the possibility of modifying the original material produced by the faculty this leading to unpredictable consequences for the kind of relationships that will develop between the staff and administration

In summary, the resulting commodification of knowledge can impact upon the academics' autonomy to define their responsibilities and control over their task. Because of the strategic relevance of knowledge commodification for the universities, the administration will be tempted to have a voice not only on the content of teaching but it could also try to impose their own criteria of performance evaluation. With innovation becoming an even more important source of funding, research topics tend to be more close to industry needs, thus changing the notions of kinds of academic work that are institutionally valued within that particular discipline field. This will certainly stimulate a new social construction around what constitutes legitimate knowledge with consequences for the criteria used for evaluation among peers. As Giddens (1991) points out, commodification influences the process of identity construction. As the author argues, commodification is not just a matter of reordering existing behaviour patterns or spheres of life. It is rather an essentially new phenomenon that influences

identity, in two ways. As a reflection of capitalism maturation commodification influences directly consumption patterns and economic growth. It is from there that it derives its strength to influence the project of the self. Academics suffer both these influences. As consumers their individual styles and needs are inevitably shaped by the imperatives of consumption. As labour force they are witnessing their skills and their tacit value being commodified, marketed and packaged into recipes just like we see happening with life styles that are packaged and distributed in self help books (GIDDENS 1991).

SCIENCE-LED OR MARKETS-LED KNOWLEDGE: IMPLICATIONS FOR ACADEMIC KNOWLEDGE IN MANAGEMENT

Management as a research and also as a professional area is not excluded from this discussion. On the contrary, it is at the centre of it. Though it may seem obvious, I can point out a few reasons that justify this statement. First, management concerns an area that deals with concrete problems but the solutions that are proposed are intangible in the sense that they involve relationships between people, things and time. In some cases they are elaborated out of abstract models, most of them conceived out of deskwork and interpretations derived from eventual contact with practice. Thus management solutions are drawn from theory and also from contact with managers and the world of practice.

The model of management knowledge production, which has predominated in most management schools, has followed the hard science model. Theory is developed out of empirical testing and its findings are supposed to feed management practice either directly, through inputs to skill formation or, indirectly by educating students that will educate managers. The underlying logic has been one in which research knowledge provides inputs directly applied to managerial jobs, a linear model that has developed after the World War II. The assumption underlying this model was that managers should acquire managerial qualifications or improve their skills by going into university training (WHITLEY 1995). Some implications for this model can be drawn out of the discussion in the previous sections.

Dissociation of practical applications from science inexorably affect the social construction around the definition of what contributes to good quality of teaching and which kind of knowledge structure has the necessary legitimacy to confer qualifications in the area. Thus, any argument that alters the importance of basic science also changes the trust in the logic, which lies behind the process of conferring qualification and certification of knowledge. It shakes the whole argument that the better universities are those that are research orientated, inverting the criterion of prestige in the academic hierarchy. This argument would not be so relevant if we were not referring to management, a discipline with close connection with management function (CURRIE and KNIGHTS 1998). The defence of the argument that basic research and innovation are not interdependent opens space also for an analogous rationale, which defends the idea that research knowledge does not contribute directly to improve management practice.

The weakness of management knowledge in terms of value for practice has been pointed out in two major ways. Firstly, some have argued that the gap between research and practice has widened and so has the gap between research and teaching (MOWDAY 1997). Researchers have also been criticised for being too concerned with publication in referred journals but do not innovate or update their courses. In addition, they have also been criticised for not being aligned with the changing business environment, with innovation demands, and have failed to lead the next generation of industry knowledge. Instead, innovations in management knowledge, one may conclude, have come from management itself (MOWDAY 1997, PORTER and MCKIBBEN 1988).

Secondly, if these weaknesses had not been enough, management knowledge has also been criticised for being too ethnocentric, for not having relevance in different contexts other than the Anglo-Saxon (ASTLEY 1985, RODRIGUES 1999, CLEGG et al. 1996, REED 1996, and CHANLAT 1994). While in the past researchers could just ignore this criticism because capitalism was less imbedded in the economic relationships in other societies; globalisation will undoubtedly impose pressures for a deeper

demand more understanding of the logic of 'contextual rationality' (REED and HUGHES 1992. RODRIGUES 1996), local rationality (LANGOFF 1997, FEATHERSTONE 1997) or cross-national differences (CHILD 1999). As demands for understanding management in its international context increases, this could represent a move away from the orthodox position which has given primacy to the organizational level of analysis (CHILD 1999). A more heterodox approach could provide an answer to these anxieties, which no doubt will be, the core of managers' afflictions in the next century. Rather than focusing on organizations themselves, the need to better understand the business context and institutions in other societies requires electing another unity of analysis: the interrelations of the organizations with the structures and functional logic of the multidimensional institutional and governance mechanisms that have emerged in current society. We can make more sense of organizations if we pay more attention to a combination of forces at the macro level with those of a meso and micro level. International bodies that exert pressures in the performance of organizations, such as the IMF, the WTO among others would constitute the macro framework that regulate global transactions, with the mesospace, being the space of influence of transnational corporations. The micro level would comprise organizations and their related network that adopt various forms of governance to improve performance.

COMMODIFICATION IN THE DIFFUSION OF KNOWLEDGE MANAGEMENT

Management has been defined as an area of knowledge where barriers to entry are low and exit is high (WHITLEY 1995). In education terms this means that an increasing number of schools and institutions of higher education are creating new business schools and are opening new business areas in these schools. It does not take long so find out that management schools and courses are booming in the west and also in the east (CHEN 1996, RODRIGUES 1999, OBLÓZ 1996). Low barriers to entry means that the market is also open to non-specialists in education like corporate universities. The

number of corporate schools is increasing at an amazing speed; while in 1960 there were around 400 corporate schools in the US, these numbers have grown to 1000 in 1996 (MOWDAY 1997:337). Some reasons could be drawn up to explain why management education and knowledge admit participants of different levels of complexity and quality. Management is an area in which university training does not seem to be very important in practice, considering the number of managers in the profession without a university degree in the area (LUZ and FURIATI 1998) and the central role of engineers in the management of modern organizations (LEE and SMITH 1992). The scarcity of managers with a professional university degree may be related to the recent world-wide 'boom' in management education (RODRIGUES 1996, OBLÓZ 1996). Management is also a discipline highly connected with problem solving activities at the work place where employers are very powerful in defining the content of managers' responsibilities and assessment. The relevance of practical experience creates room for a dispute about which organization is able to deliver the appropriate training in the acquisition of professional skills, if universities, or firms themselves (WHITLEY 1995). Up to a given point, certain types of may be management knowledge easy to codify judging by the number of distant training adverts, which are now frequent in newspaper sections about job and courses offers.

The consequences of commodification of management knowledge can be various. Because of the fragility of the research-based strategy in the construction of the academic legitimacy and the conditions of low entry barrier and high exit in management education, researchers that do not adopt the utilitarian view of knowledge would run the risk of becoming less relevant in the hierarchy[2]. As a result, one can speculate if there will be a smaller number of potential positions for soft or social

[2] Some argue that the managerialist approach to organizations has a utilitarian bias in the sense that it believes that there is no managerial science without prescription. Managerialism is utilitarian in principle in the sense that it defends the viewthat knowledge has necessarily to be connected with practical solutions. The purpose of knowledge in management is tocontribute to improvement of performance of managers as a consequence, of the organization. As Currie and Knights(1998) argue, this kind of view is criticised because of its tendency to exclude multidisciplinary and critical knowledge, and also because it implies that knowledge obtained through research and for its own sake is not important.

science based knowledge and also fewer opportunities for promotion. It is therefore germane to ask how far theory will be important in this context, considering that the objective of theory construction is contribute to better understanding reality. Its relevance to practice is not immediately evident. If the scholars' attitude towards change is passive, public funding for social science-based disciplines may suffer from a substantial and unexpected reduction. An implication of the emphasis on utilitarian approaches may be the increasingly lower voice of the non-managerialist discourses in the process of selecting courses and research problems. Disciplines and research lines grounded on human and social sciences may decrease in importance. Interpretation of research findings could even be closer to management interests, therefore, fulfilling arguments brought forward earlier by Benson (1977) and Astley (1985) that management theory is inclined towards managerial ideology.

CONTROL OVER KNOWLEDGE PRODUCTION AND APPROPRIATION

As shown in Figure 2, one characteristic of management in comparison with other kinds of professional knowledge is its social and human science basis and its multidisciplinary features.

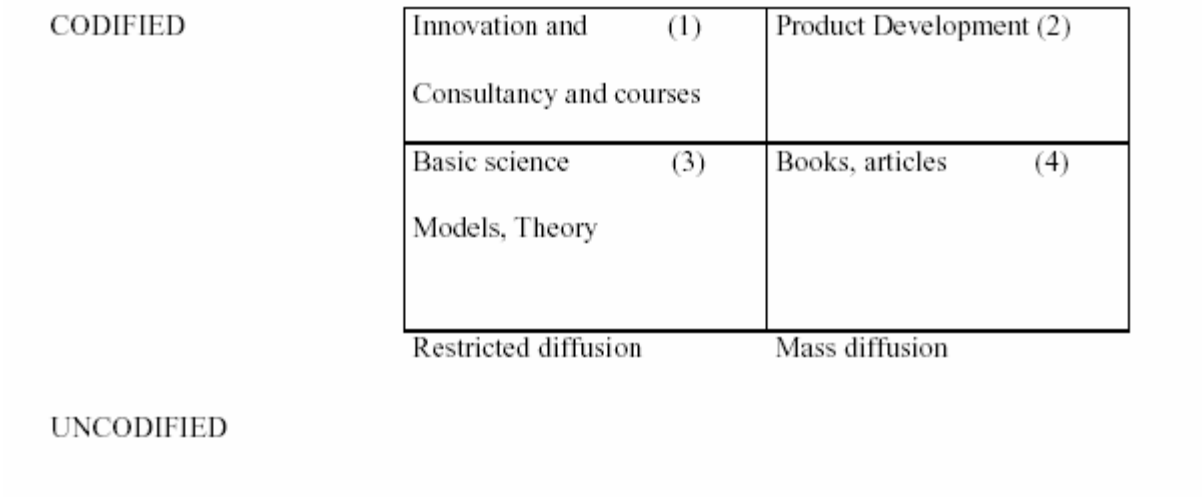
Management knowledge cannot count on a hard science from which it can derive principles or applications. Because management is founded in social sciences, the outcomes of knowledge are intangible in nature. As mentioned, one of the advantages of new technologies is the possibility of packing intangible products for mass diffusion. This implies that lectures, technical advice and scientific information can be transformed into products by using CD ROMs and electronic technology. However, for these undifferentiated products to reach the stage of stand alones they require a minimal degree of codification through standardisation.

Figure 2. Products of knowledge in management and control

CODIFIED	(1) Consultancy	Models (2) Cable TV, CD ROMs, Websites, Eletronic courses, Traditional continuing education courses
UNCODIFIED	(3) Social Sciences Theory	(4) Books, articles
	Restricted diffusion	Mass diffusion

Management theory, however, reflects the complexity of integrating multidisciplinary knowledge and also contributions from various constituencies such as consultants and practitioners (CLEGG et al. 1996). Models nevertheless can be presented in a fairly codified way, particularly if they are based on prescriptions. They facilitate the transformation of management ideas into a metaphorical format, allowing mass diffusion. Managerialist models are more liable to change by embelishments capable of making them into products ready for consumption. While its possible to widely diffuse management models through mass courses, knowledge implicit in consultancy is available to just a few.

Figure 3. Products of knowledge in engineering and control



As shown is Figure 3 engineering, by contrast, relies more on hard sciences and, its theories are not drawn from such a large diversity of frameworks. The difference between management and engineering is that while in management, uncodified and also codified knowledge are intangible in nature, in engineering codified knowledge both for restricted and mass diffusion can achieve a greater level of concreteness. Innovation is subject to proprietary control and so is engineering products.

Management knowledge however, can hardly be defined in terms of a stand-alone product. To reach the state of proprietary knowledge it has to be codified by reducing its abstractness and complexity (BOISOT 1995: 175). In engineering, the technology and product application are highly interdependent. Neither the technology nor the knowledge it embodies can serve to a different purpose without adaptations. The diversity in the usage of a product is not dependent on the knowledge holder. In the case of management knowledge outcomes, it is the symbolic value associated to the content of the knowledge that assign a specific meaning to the technology. It is that meaning associated to the utility of the knowledge the condition that gives credit to it by permitting its transformation into a concrete product. For example if a lecture is video taped for commercial purposes, its economic value is associated to the knowledge holder, or to the quality of knowledge embedded into the technology.

Some implications can be drawn for both management and engineering if the information on the above figures is taken into account. First, knowledge based on hard science is not easily subject to appropriation until it reaches the innovation or product stage. When it reaches that stage it can be turned into proprietary knowledge. Management knowledge, even when it is more tangible cannot be as concrete as an engineering product, because it is social science based. Knowledge in management is liable to appropriation by non-experts, as it is less context-specific. Until recently it would have been unthinkable to commodify this kind of knowledge. Nowadays, management knowledge can be subject to copyright, thanks to new technology. Nevertheless, even when ownership is defined through proprietary knowledge, this does not avoid the risk of appropriation by means of contract arrangements with managers, as has already been mentioned in this paper. Perhaps due to its multidisciplinary feature, management models are only loosely connected to theory that, on its turn, has not been always grounded in practice. Research approaches have not always been very effective in demonstrating the connection between theory and practice (ASTLEY 1985, CLEGG et al 1996). Thus the connection between the management products in the boxes 1, 2 and 3 with social science theories in box 1 is weak (Figure1); the lack of one single science to support management models, makes knowledge more vulnerable to appropriation and to criticism. This maybe the reason why the dispute about which source of knowledge should constitute the basis of management education, if research or practice (CURRIE and KNIGHTS 1998) is now at the top of the agenda various interests. The combination of managerial skills with technology is considered crucial to competitiveness advantage (PORTER 1986, 1996). By creating corporate universities transnationals create favourable conditions for unifying and diffusing management approaches that could support their strategies of expansion and global co-ordination (CHILD 1999).

CONCLUSION

Some arguments have been advanced in this paper that has a bearing upon re-definition of which kind of knowledge will be the focus of universities. With new technology, firms and universities are increasingly devoting to the task of changing tacit knowledge into a concrete and distinct product. It is argued that some factors such as globalization, the increasing salience of the market in organizational decisions have promoted commodification of knowledge even in universities. While globalization has worshipped innovation as the solution to upgrade the level of development of a given nation, this has also subverted the social importance of science in innovative processes. Because of the demise of basic science and the increasing external pressures universities, from now on, will tend to pay more attention to solution of problems that are assumed to impact on a country's relative position in competitiveness ranks. Thus the market, the State, TNCs or industry, those institutions that have been empowered by new-liberalism will have a stronger voice in defining the worth of research subjects rather than it will be a matter of academics' own discretion or choice.

Though basic science has its intrinsic value, much of its societal worth comes from its association with solution of practical problems and consequences for improving the quality of life, and advancement of society. Dissociation of basic science from applications either in cases in which the application has a more intangible dimension (management) or in cases in which it can be converted into stand-alone product (engineering) tends in the long run, to reduce the significance of science-based knowledge. Despite the loose connection between research-based knowledge and managerial practice, conventional management education may still witness its significance to endure because of the market pressures. The growing number of students and schools can be a positive sign in the sense of indirectly reflecting the relevance of research-based education. On the other hand, the fact that management skills are considered decisive for economic development and for strategies of expansion and governance of transnational corporations' raise the social and economic relevance of knowledge in management.

It has been mentioned innumerable times that basic science is costly, but it is also well known that its cost estimations are very imprecise (FREEMAN and SOETE 1997). The question, which remains open, is whether its costs can be reduced as a response to changes in supply and demand. The answer will probably depend on the power of the institution behind knowledge production - the university - and institutional closeness behind scholarship values. If the latter is strong and unified enough around the values that define and control conformity with the scientific enterprise, and the former can provide fair wages, then the market demands will be less important. The invisible hand of the market can infiltrate academy if the reward system is perceived as unfair and the institution that regulates academic values is weak; this will provide the necessary gaps for the market to impose strong pressures.

The discussion in this paper leads to a question, which has been one of the main concerns of scholarship in organization theory. What is stronger, the market or institutions? This question is important not only as an intellectual issue for scholarship but also for the definition of future careers and quality of education. The logic of neo liberalism shows that markets have their way when institutions are weak. But in order to become strong markets need first to weaken traditional structures: strong institutions are able to use the market opportunities in order to be stronger. But the market uses the weak, instead. This paper was not intended to be about morals, though I have to acknowledge that the discussion presented here necessarily draws upon moral issues. The market is all but democratic as it is a slave of a mechanism beyond its own control – the price system – that yields market rules that are highly selective and exclusive.

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