

THE COGNITIVE INTERNATIONAL DIVISION OF LABOUR HYPOTHESIS: WHAT POSSIBLE EFFECTS FOR THAI LABOUR AND EDUCATION?

Journal of Education, Vol. 33, N° 1-2, January-December 2006.

Bruno Jetin ⁽¹⁾, Economist, IRD researcher, (France), CELS, Faculty of Education
Chiang Mai University.

Introduction.

Late capitalism has entered a new phase. It is not only global and financialised, but also based on a new technological revolution that gives a special emphasis to knowledge ⁽²⁾. Not all these trends are at work in developing countries. Financialisation for instance, i.e the priority given to the remuneration of shareholders by all means, which is much debated in developed countries for its impact on employment, wages and the welfare state, is not an issue at stake in Thailand for the simplest reason that the stock and bond markets do not play a decisive role in its economy. But globalization, the ICT revolution and knowledge will impact Thailand in the near future because they are shaping a new international division of labour ⁽³⁾, the so-called “cognitive division of labour”, alongside the traditional international division of labour, sometimes pinned as the “taylorist” division of labour”. Thailand has benefited for decades from the “taylorist” division of labour to launch and reinforce its industrialisation process for it offered cheap and disciplined labour to multinational companies eager to produce at low cost for the Thai and foreign markets. The question for the future is as simple as that: can Thailand go on the same way or will it have to engage profound reforms in order to be part of the new division of labour? A subsequent question is: why is it of interest for specialists of education?

We don't pretend in this modest contribution to answer comprehensively and definitely such a complex question. But we would like to present some arguments that can be of help for a collective debate. We will first explain what the “cognitive international division of labour” is about, which leads us to define what we mean exactly by “knowledge” (part 1). We will then turn to the consequences on employment and education in Thailand by engaging in some tentative assumptions (part 2).

Before we start, it is very interesting to note that at the origin of all the scientific debate involving the concept of knowledge, across various different fields

¹⁾ The view expressed here are the sole responsibility of the author and do not engage the above institutions. Comments can be sent to the author to the following address: bjetin@yahoo.fr

²⁾ We refer here to the so-called Information & Communication Technologies (ICT) paradigm that started to diffuse rapidly in the economic system in the last two decades. Differently from the previous mass-production technological paradigm, which had a strong energy and material intensity, the new one is characterised by strong knowledge intensity. For a comprehensive analysis, see F. Castellacci, 2005.

³⁾ The term “international division of labour” is used in economics to describe the specialisation of countries in productive activities in accordance to their natural resources, their labour force and capital stock but also their Research and Development (R&D) capacities, their social relations and institutions and the decisions taken by private companies.

or research, we find theories of education and learning. It is also not a coincidence that education policies are at the centre stage whenever states try to define new strategies to “benefit from”, to “adapt to” globalisation or simply not to be left behind. This is why we hope to catch the attention of scholars of education research.

Part 1. A new cognitive international division of labour?

According to some authors like El Mouhoub Mouhoud (2003, 2004), the growing importance of knowledge in productive activities is giving birth to a “cognitive division of labour” alongside the traditional “taylorist division of labour”. This last one, which was dominant during the “golden age” of post-war world growth (1950-1974), used to divide productive processes into homogenous operations whose productivity increased with the degree of specialisation of the workers and the capital they use. The “cognitive division of labour” follows a new logic where productive processes are no longer divided in narrowly specified operations, but into homogenous knowledge blocs whose unity relies on the scientific and technical principles that enable the interpretation of information, the creation of new knowledge and learning. Workers are no longer specialised in a specific task but in “a field of competences”. Firms adopt organisational models focused on the maximisation of their capacity of learning and innovation.

This “cognitive division of labour” has increased further the polarisation of economic activities at the world level which is a structural feature of globalisation. One can observe these last 15 years a movement of internationalisation of R&D operated by multinational firms through mergers and acquisitions mainly, but this movement is even more restricted to the developed countries and very few emerging countries than what has been observed previously for productive activities. It concerns more the development phase than the fundamental research phase which usually remained located in the country of origin. China for instance, which is the major recipient of Foreign Direct Investments (FDI) among the developing countries, has attracted US\$15.6 billion of FDI in R&D in 2002, up from US\$1.8 billion in 1991, but these investments are for the moment dedicated to the adaptation of foreign products to the Chinese market. This is due to the fact that fundamental research needs a geographical proximity to make possible face-to-face interactions. At this stage, knowledge is still in the process of creation and cannot be codified in order to be transferred abroad. This will be only possible at a later stage, when knowledge is already stabilised and needs to be adapted to local needs by specific developments. But this can be realised only in countries where “communities of practice”⁽⁴⁾ already exist, i.e. a community of local scientists, engineers and business men who “speak the same language” (in the intellectual sense) as their counterparts in the country of origin, understand instinctively the knowledge content of the new product or equipment because they share the same scientific culture and are able to absorb the relevant knowledge.

Again, the example of China is illustrative. Even if it is still lagging behind in terms of knowledge creation, China can rely on a strong scientific and education

⁴⁾The term “community of practice” will be defined more rigorously below, in section 2.2.

system and is trying to create a “National Innovation System” (NIS) ⁽⁵⁾. Already high ranked universities and powerful scientific institutions are able to sign contracts with multinational companies in the field of fundamental research. Meanwhile, China has doubled its investments in R&D from 0.60% of Gross Domestic Product (GDP) in 1995 to 1.26% in 2002. Chinese companies account for 39% of these investments. If China succeeds, it will join the very few emerging countries such as Korea, Taiwan, Hong Kong or Singapore that have managed to build NIS that now enable them to compete with developed countries in the field of innovation, at least in certain fields.

Without this patient and long-term investment in the NIS construction in conjunction with the educational system, which implies a real commitment by governments, developing countries run the risk of a “forced disconnection” (E.M. Mouhoud, 2003) from the scientific and technological competition and the related economic activities. This risk is increased by the extension of intellectual property rights on innovations that may be easily by-passed for some products such as software, but much less easily in the case of medicine and bio-technologies for instance. As imitating may prove more difficult in the future than in the past, the case for a strong NIS to create local R&D capacities is strengthened (R. Nelson, 2004).

As we can see, the consequences for developing countries are potentially very negative, because the “forced disconnection” would lead to an economic slowdown before the process of catching up with developed countries being achieved. This justifies that the hypothesis of the “international cognitive division of labour” will be analysed in details in this paper. This hypothesis relies on two assumptions namely the idea of a new phase of capitalism and the increasing role of knowledge.

1. Since the end of the “golden age” of high growth in developed countries (1950-74), there is an on-going debate about the emergence of a new kind of capitalism, a “new economy”, a “post-industrial society”, a “post-fordist” economy ... and now the “knowledge-based economy” or even the “learning society” ⁽⁶⁾. The long list of terms and concepts reveals the difficulty to establish with a minimum of certainty the coming of a new era. Our purpose is certainly not to coin a new term with its own copyright. We think that the reality is more complex because the future is always blended with the past. And the temptation of those arguing in favour of a new era is to overestimate new tendencies and their pervasiveness. On the contrary, those who argue against the existence of a new era tend to disregard every novelty as anecdotic, and stress how much the society and the economy remain broadly the

⁵⁾ The concept of National Innovation System (NIS) has been developed since the 1980s by economists (C. Freeman, 1982, G. Dosi et. al., 1988, B.A. Lundvall, 1992, R. Nelson, 1993) that refer to J. Schumpeter to establish an evolutionary theory of technical change. The NIS is a core conceptual framework for analysing technological change, which is considered to be an indispensable foundation of the long-term economic development of a nation. “NIS is the interactive system of existing institutions, private and public firms (either large or small), universities and government agencies, aiming at the production of science and technology within national borders”. P. Intarakamnerd et. al. 2002. See also OECD, 1997.

⁶⁾ In the academic sphere, the concept of “knowledge” is regarded as critical for the future of economies and firms since the beginning of the 1990’s (R. Reich 1992, P. Drucker, 1993). It is rooted in theories of the firm and organisational learning (C. Argyris, D.A. Schön, 1978), theories of innovation (B.A. Lundvall, B. Johnson, 1994), theories of growth and now theories of development. Some institutions like the World Bank (1999) made a lot of fuss about “knowledge” presented as a new fairy’s wand that could resolve at once all problems related to development.

same. C. Lloyd and J. Payne (2005) summarise this debate by distinguishing the “knowledge-based optimists”, “the knowledge-based pessimists”, and the “sceptics”. The optimists assume that “an inevitable shift is taking place towards a knowledge economy that will automatically raise the level of skills, knowledge, education, training and learning required of all employees...” (op. cit. p 209). The pessimists assume that “... skills needs are increasing and that the only way advanced economies can secure long-term competitive advantage is by adopting high-skills approaches” (op. cit. p 210). The sceptics question whether “... the rules of international competition have changed so fundamentally that there exists only one viable “high skills” route to competitiveness and profitability for advanced capitalist economies” (op. cit. p 211). On this point, the sceptics are right. At the national level, numerous studies have demonstrated the “variety of capitalism” (B. Amable, 2003, R. Boyer, 2004) and at the sector and firm levels, the existence of a plurality of strategies of profit, even within the same industry (R. Boyer, M. Freyssenet, 2002). It is therefore no surprise that in retail, banking, insurance, hospitality and catering, cleaning, security, restaurants, and other services but also in “old economy” industries lot of firms opt for low skill, low wage and casualised workforce. This does not precludes that at the same time, new industries with high knowledge content are requiring higher skills for more complex but good paid jobs. The reality is in fact a polarisation of skills and jobs (Grugulis, I., C. Warhurst and E. Keep (2004). In the UK for instance, national skill surveys reveal a “...consistent upward movement in the complexity of jobs carried out...” a “...significant rise in the qualification requirement of jobs... notably an increase of degree-level jobs from 10% in 1986 to 17% in 2001 (A. Felstead, D. Gallie and F. Green (2004). But at the same time, “... whereas there are now 2.9 million economically active people aged 20-60 who hold no qualifications, there remain 6.5 million jobs for which no qualification would be required to obtain them” (op cit, 166). The question is whether this polarisation between high skills top end and low skills bottom end jobs that one can observe inside developed countries is now spreading at the international level. Developed countries would be ever more specialised in top end knowledge-based activities while developing countries would be stuck in bottom end “taylorist” activities.

2. One way to answer this question is to define what is knowledge to understand why it can threaten the process of development. In economics, knowledge encompasses scientific research and its transformation into technology and all the opportunities to learn something during the realisation of economic activities (Commissariat General au Plan, 2002). This means that the creation of new knowledge can be deliberate such as R&D, or partially deliberate such as learning by doing in production units, interactions between companies and their customers or suppliers. In these last cases, people may not be aware that they are learning something. Because globalisation has increased competition between firms at an unprecedented level, R&D is even more subordinated to economic logic and learning during economic activities has acquired a new importance. In these circumstances, late capitalism is trying to rationalise further not only scientific research, which is an old phenomenon, but also learning while buying, selling and working, which is rather new. In a way, it is the extension of the old concept of

learning by doing which has been observed and theorised since the 1950-1960's in industrial production mainly (K. Arrow, 1962) to the whole range of economic activities. In the simplest acceptation, learning means gaining knowledge and this is why theories of learning in the field of education research and the philosophical theories of knowledge that underpin them have catch attention of many scholars from different scientific disciplines engaged in the analysis of the "learning economy". This justifies why in this first part of the article, we will focus on the meaning of knowledge and its relevance for economic activities, leaving the education aspect to the second part. Our basic idea is that the "international cognitive division of labour" gives too much emphasis to R&D, which is only one form of knowledge, the most explicit one, and not enough to the other forms of knowledge. What's more, the opposition between the cognitive division and the taylorist division of labour is too simplistic and does not reflect the complexity of the way work is organised inside plants.

1.1. Knowledge, which knowledge?

Knowledge is first defined as "what we know" which is distinct from information that is a mere flow of messages.

- "Knowledge involves the mental process of comprehension, understanding and learning that go on in the mind and only in the mind, however much they involve interaction with the world, outside the mind, and in interaction with others. Whenever we wish to express what we know, we can only do so by uttering messages of one kind or another – oral, written, graphic, and gestural or even through "body language". Such messages do not carry "knowledge", they constitute "information", which a knowing mind may assimilate, understand, comprehend and incorporate into its own knowledge structures. These structures are not identical for the person uttering the message and the receiver, because each person's knowledge structures are, as A. Shutz (1967) puts it, "biographically determined". Therefore, the knowledge built from the messages can never be exactly the same as the knowledge base from which the messages were uttered" (T.D. Wilson, 2002).

This long citation synthesises all dimensions and complexities included in the concept of learning and knowledge. Learning means acquiring knowledge, which involves a cognitive activity, in an interactive, i.e. social context, implying communication. Taking stock of this broad definition, theoreticians usually differentiate several dimensions and meanings according to their focus and scientific discipline. Knowledge is acquiring abstract ideas both individually by mental reasoning and by participating in collective practice. Knowledge is both implicit and explicit. We will start by turning our attention to the implicit /explicit dimensions leaving the individual/collective dimension for the second part of the paper.

According to J.S. Brown and P. Duguid (2001), two philosophers of science, G. Ryle (1900-1976) and M. Polanyi (1891-1976) are the most widely cited in the knowledge literature.

G. Ryle (1949) was among the first to establish a distinction between knowing *how* and knowing *that*. *Knowing that* is the factual knowledge which can be

expressed in propositions, and judged as “true” in respect to criteria of truth. *Knowing that* is also defined as the form of theoretical knowledge. By contrast, knowing how is “...knowing means and methods to do something” (G. Ryle, 1949). This thing can be an intellectual operation in which case it is *knowing how* to do a logical inference, or it can be a practical thing, how to cook a fried rice, for instance.

“Knowing *how* cannot be defined in terms of knowing *that* (G. Ryle, 1949, p 32) as the traditional analytical philosophy holds. More precisely, there are two moments in the *knowing how* but only one can be assimilated to knowing that. In the analytical philosophy, action is a “rule-following activity”. Ryle agrees with this conception but specifies that knowing rules (or instructions) is not enough to act. It is necessary to know how to apply the rules according to some principles, recipes and maxims crucial for the achievement of the action. These principles, recipes and maxims are usually expressed in assertions and as such take the form of knowing *that*. Yet, there remains a second moment in the knowing *how* that cannot be expressed in rules. It is an irreducible practical knowing *how*. Knowing how to follow a rule is a practical skill acquired through experience and repetition. Ryle insists that knowing *that* and knowing *how* are not two separated actions such as: “first I do a bit of theory and then I do a bit of practice” (op cit 1949, 29). They occur at the same time and are interdependent. Ryle takes the example of the chess game. Knowing the rules of chess (knowing *that*), does not tell you how to play chess (knowing *how*), even if you cannot play chess without knowing the rules. To be useful, knowing *that* requires appropriate knowing *how* which is acquired by practice (by playing chess in the example).

A good chess player can explain after the party is finished why he has played this way and this can be appropriated by other players. This is the part of knowing *how* that can be made explicit. But he cannot explain everything and in particular why he has thought about a series of moves at a precise moment. There is a core knowledge that cannot be expressed.

G. Ryle’s philosophical work has incited M. Polanyi to engage into the theorising of practical activity. Practical activity should not be confused with manual activity. M. Polanyi was a chemist who turned later to the philosophy of science and focused on scientific knowledge by observing among others, how one of his colleagues, a physicist who became Nobel Prize, was working. Knowledge is first of all a skill:

“I regard knowing as an active comprehension of the things known, an action that requires skill. Skilful knowing and doing is performed by subordinating a set of particulars, as clues or tools, to the shaping of a skilful achievement, whether practical or theoretical. We may then be said to become ‘subsidiary aware’ of these particulars within our ‘focal awareness’ of the coherent entity that we achieve. Clues and tools are things used as such and not observed in themselves. They are made to function as extensions of our bodily equipment and this involves a certain change of our own being” (M. Polanyi 1958:vii).

Polanyi distinguishes a tacit and an explicit dimension in knowledge that echoes G. Ryle’s contrast between knowing *how* and knowing *that* (J.S. Brown and P. Duguid, op cit, p 204). To summarise, tacit knowledge refers to know *how* and

explicit knowledge to knowing *that*. The first is practised but the other is essentially taught ⁽⁷⁾.

M. Polanyi is famous, among other things, for its conceptualisation of “tacit knowledge”. Tacit Knowledge means hidden knowledge, hidden from the consciousness of the knower. M. Polanyi (1966) most quoted line is “we know more than we can tell”. Tacit knowledge is therefore unspeakable by contrast with explicit knowledge. M. Polanyi (1966) uses the example of riding a bicycle to make clear his distinction between the two forms of knowledge. We quote here the summary made by J.S. Brown and S.C.N. Cook (1999).

- “To be able to ride a bicycle, one needs to have the (tacit) knowledge of how to stay upright. This is knowledge one possesses; it is not the activity of riding itself but knowledge used in riding (you still possess the tacit knowledge even when you are not riding). Possessing this tacit knowledge makes it possible to keep upright, which is something that the explicit knowledge of which to turn cannot do. We can’t put a novice on a bicycle saying:” OK, take off – and if you start to fall like so, turn this way” and expect the person to be able to ride successfully. The novice would have the explicit knowledge but not the necessary tacit knowledge... In order to acquire the tacit knowledge, a novice has to spend a certain amount of time on a bicycle. Indeed, it would even be possible for someone to be able to say in great technical detail what must be done to keep a bicycle upright, yet still be unable to ride one” (op. cit. pp 384-385).

J.S. Brown and S.C.N. Cook (1999) add that each form of knowledge can sometimes but not always be used as an aid in acquiring the other which does not mean that one form can be converted into the other.

- “When we ride around with the aim of acquiring the explicit knowledge (discovering where to turn), we are not performing an operation on our tacit knowledge that turns it into explicit knowledge; we are using the tacit, within the activity of riding, to generate the explicit knowledge. The explicit knowledge was not lying inside the tacit knowledge in a dormant, inchoate, or hidden form; it was generated in the context of riding with the aid of what we knew tacitly. Likewise, if you know explicitly which way to turn but cannot ride, there is no operation you can perform on that explicit knowledge that will turn it into the tacit knowledge necessary to riding” (op. cit. p 385).

In other words, tacit knowledge is a necessary presupposition to articulate scientific knowledge or to achieve a practical action. This presupposition is often but not necessarily inexpressible. It can be a rule of action that we use in practise and that we follow unconsciously and by habit. In this case, we are not able to express it. Riding a bicycle or dancing is a good example. But sometimes, part of tacit knowledge can be expressed.

⁷⁾ It is not unconceivable however that knowing *that* (explicit knowledge) can be sometimes acquired by observation and practise. One can imagine a novice observing two chess players and discovering progressively the rules. Or if the novice plays against a computer, this one will tell him that an action is forbidden. But this process is surely lengthy and difficult. Learning directly the rules with a book, or with a teacher is in this case much easier and faster.

Let's take again Ryle's example of the chess game. A good player can explain later why he decided to play in a certain way. But the instinct and the genius of a good player can never be made totally explicit because it is deeply rooted in its inner self. A good player can say: "I knew by instinct that I had to play this move", but he cannot always explain why. As M. Polanyi (1958) puts it: "Tacit knowing achieves comprehension by indwelling and... all knowledge consists of or is rooted in such acts of comprehension". This means that the other players that listen to the explanation from the good player will not necessarily be able to reproduce his moves when necessary. Other examples can be found. A chef can write a book about cooking (i.e. information) presenting all his "secrets" but those who will try to apply the recipes will soon discover that the tricks of the chef cannot be easily imitated. The same can be said from a famous musician that teaches to apprentices. There is an irreducible part of tacit knowledge or knowing *how* that cannot be transferred and maybe it is the most important one.

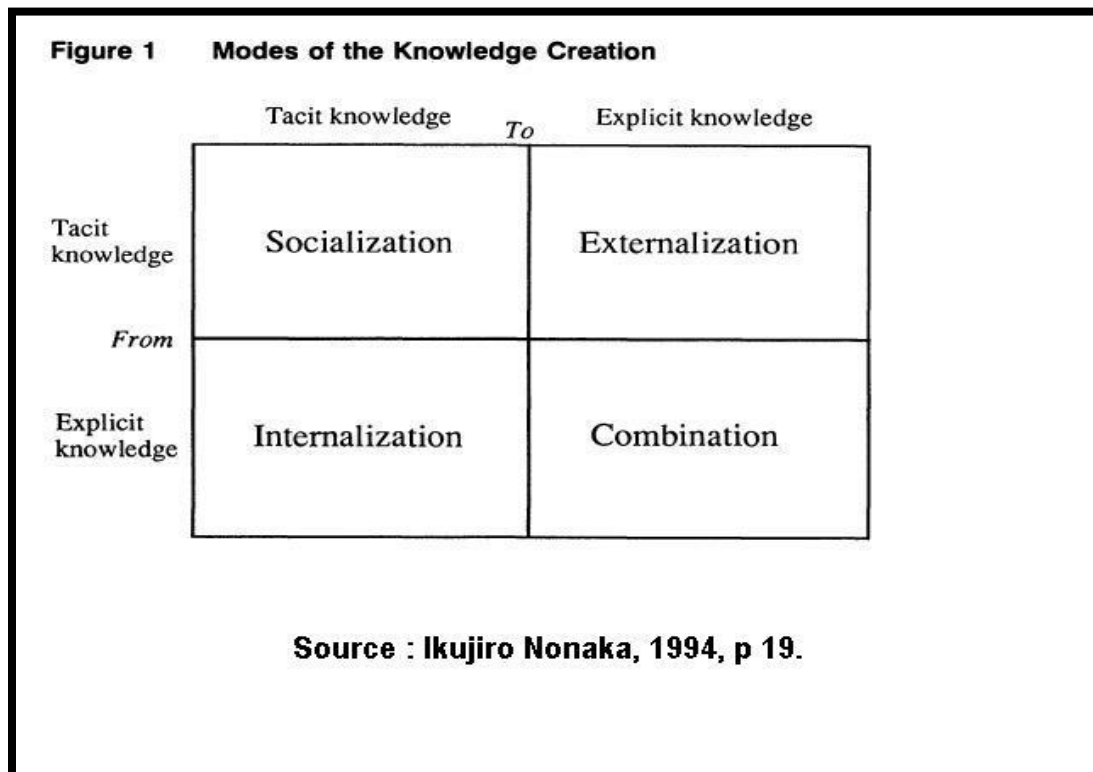
This point is crucial for the application of this theory of knowledge to economy. Several scholars first and then numerous management gurus have realised that tacit knowledge could be a new source of value creation. Employees were the depositors of a knowledge whose firms were not yet aware of. By extracting this hidden knowledge and bringing it to light, there was a possibility to increase the efficiency of the firm. Soon the new golden rush gave birth to a new fad among consultancy companies called "knowledge management". Scholars more seriously reinterpreted the already huge literature on "organisational learning".

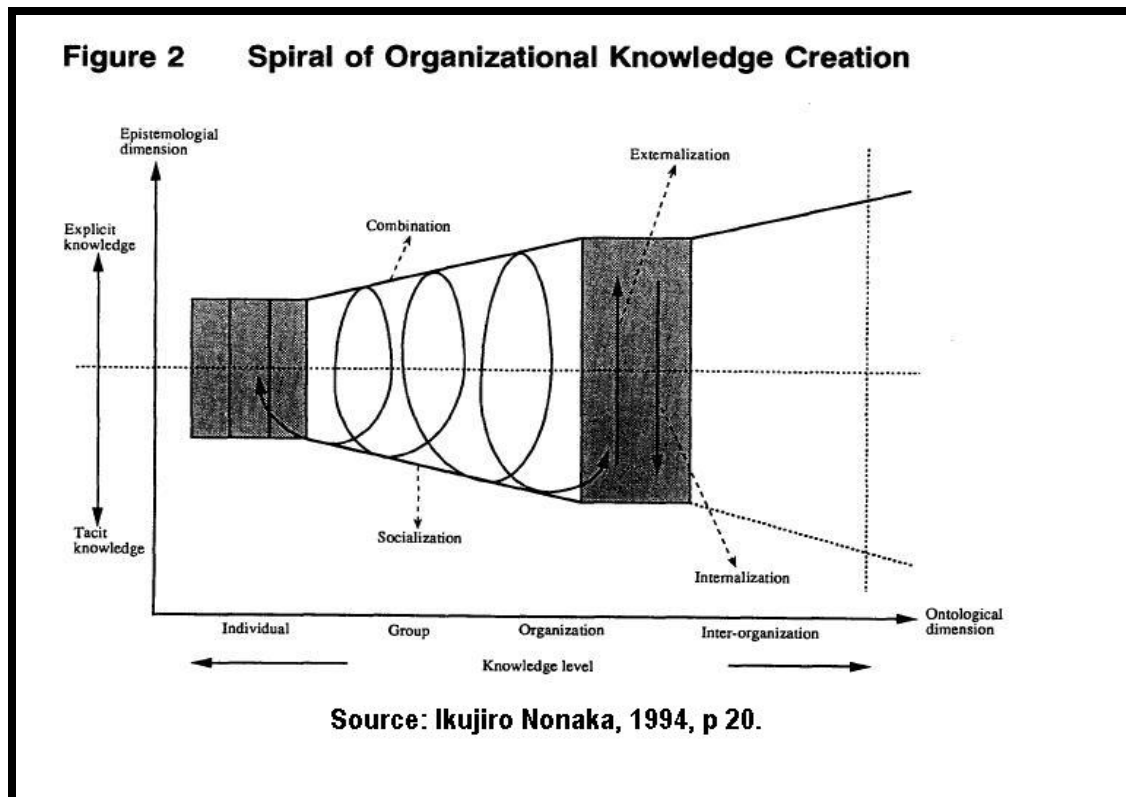
I. Nonaka (1994) was probably the first to formalise the idea that tacit knowledge could be "captured" and turned explicit. He refers to Ryle's and Polanyi's concepts and in particular the fact that tacit knowledge "... indwells in a comprehensive cognizance of the human mind and body" (I. Nonaka, op cit p 16). He then goes on to state that: "While Polanyi argues the contents for tacit knowledge further in a philosophic context, it is also possible to expand his idea in a more practical direction" (op. cit. p 14).

To do so, he considers four modes of "knowledge conversion". The first from tacit knowledge to tacit knowledge through interaction between individuals is called "socialisation". The second from explicit knowledge to explicit knowledge "... involves the use of social processes to combine different bodies of explicit knowledge" (op cit p 19), such as meetings and other forms of communication (computers for instance) is called "combination". The third and fourth modes relates to the conversion of tacit knowledge into explicit knowledge and vice-versa. It relies on "... the idea that tacit and explicit knowledge are complementary and can expand over time through a process of mutual interaction" (op cit p19). The conversion of tacit to explicit knowledge is called "externalisation" while the conversion of explicit into tacit knowledge is called "internalisation" because it "bears some similarity with the traditional notion of learning". Figure 1 illustrates these four modes of knowledge conversion.

Each form of knowledge can create new knowledge independently but the dynamic between the four modes is far more efficient for organisational knowledge creation. Tacit knowledge held by individuals is at the heart of the knowledge creating process through a dynamic "entangling" of the different modes of

knowledge conversion referred as the “spiral model” of knowledge creation illustrated in figure 2. It moves from the individual level up to the collective and then to the organisational level. “First the socialisation mode usually starts with the building of a “team” or “field” of interaction. This field facilitates the sharing of members’ experiences and perspectives. Second, the externalisation mode is triggered by successive rounds of meaningful “dialogue”. In this dialogue, the sophisticated use of “metaphors” can be used to enable the team members to articulate their own perspectives, and thereby reveal hidden tacit knowledge that is otherwise hard to communicate. Concepts formed by teams can be combined with existing data and external knowledge in search of more concrete and sharable specifications.





This combination mode is facilitated by such “triggers” as “coordination” between members and other sections of the organisation and the “documentation” of existing knowledge. Through an interactive process of trial and error, concepts are articulated and developed until they emerge in a concrete form. This “experimentation” can trigger internalisation through a process of “learning by doing” (I. Nonaka, p 20).

This citation shows that interaction between the team of workers is critical to transform tacit knowledge into explicit knowledge and we will see in part 2 that this point will be further develop by the new theories of situated learning (J. Lave and E. Wenger, 1991). It also confirms that the kind of tacit knowledge that I. Nonaka is dealing with is the one that can be expressed, leaving apart the other part that cannot be expressed. And finally, we find the idea that abstract knowledge fixed into explicit knowledge can be integrated into tacit knowledge. Although this point is also extensively discussed in theories of learning, because it is part of the core process of learning, it also raises criticisms regarding its coherence and fidelity with Ryle’s and Polanyi’s theoretical framework.

According to R. Brohm (1999, p 1) “Polanyi’s epistemology has been interpreted within an objectivistic paradigm” and this creates a clash that leads either to “inconsistency or to a complete reinterpretation of Polanyi’s knowledge concept... that is from a philosophical point of view... naive or outdated”. J. Kinghorn and C. Maasdorp (1999, p 5) argue that “Knowledge Management has not gone far enough with an emphasis on the tacit dimension of knowledge. “Unless one assumes that an employee’s tacit life coincides entirely with the tacit requirements of the organisation, it is difficult to escape the conclusion that the knowledge spiral proposed by I.

Nonaka, only tangentially links up with the tacit dimension of human existence". T.D Wilson (op cit) is even more radical in his criticisms. If some knowledge is not normally expressed but can be expressed, then it is not tacit knowledge in Polanyi's sense, but what he calls "implicit knowledge". "Implicit knowledge is that which we take for granted in our actions, and which may be shared by others through common experience or culture". When expressed, implicit knowledge turns into information if embedded in a context of relevance to the recipient, and can be codified into explicit knowledge, stored, and shared through electronic networks for instance.

The crux of the debate is that information can be managed but tacit knowledge cannot.

While I. Nonaka's idea of "knowledge conversion" certainly violates G. Ryle's and M. Polanyi's theories of knowledge, especially the conversion of tacit knowledge into explicit knowledge and vice-versa, his theory still takes into account the existence of tacit knowledge in Polanyi's sense, and tries to think how tacit knowledge can be revealed and shared through interactions, even if we can think that he is rather optimistic. His theory had a great impact because it touches concrete problems that workers and companies have to deal with every day.

But his idea of "knowledge conversion" has paved the way for a far more radical view. P. Dasgupta and P.A. David (1994) have argued that tacit and explicit knowledge are not complementary like in Polanyi's framework but substitute. This means that you can substitute tacit knowledge by explicit knowledge. They go one step further in the way of identifying knowledge and information in the sense that now explicit knowledge is called "codified knowledge" to stress the idea that due to the Information and Communication Technology (ICT), conversion relies on the power of computers, intranet and internet. Knowledge is codified at a reducing cost leading to the increased codification of tacit knowledge. Technical progress in ICT leads to a reduction of their cost and therefore a reduction of the tacitness of knowledge. Cowan and Foray (1997, p 3) define explicitly the codification of knowledge as the "process of conversion of knowledge into messages which can be processed as information". And, finally, Cowan et. al. (2000), rather than addressing empirical evidence falsifying their position, launched an attack against tacit knowledge which has become a buzzword". Instead of tacit knowledge, they prefer to use the term "unarticulated knowledge" to underline the idea that in principle all knowledge can be codified, and only the cost of codification prevent it to be completely codified. They think that thanks to the reducing cost of codification, we may expect that in the future the whole knowledge, not only tacit knowing that but knowing how will be codified.

This discussion may appear as purely theoretical and detached from reality. It has in fact very concrete consequences. If one thinks like Cowan et al. that "knowing how to do it" is equivalent as being able "to say what the steps are" then "nobody should be worried to be operated by a surgeon that only learnt surgery from a book" (P. Nightingale, 2003, p 171). The absurdity of the proposition (except for those who are not risk-averse at all) is so obvious, that this radical view should be dismissed right away. M. Polanyi's was right in stating that tacit knowledge is indwelled, and everyone should be better off to be operated by a surgeon whose knowing how is deeply embedded in his inner self.

Nonetheless, once we have rejected this radical view, there remain two basic facts that can be consensual:

1. Part of tacit knowledge can be revealed and expressed ⁽⁸⁾ and firms are reshuffling their organisation to capture this important field of knowledge and turn it into a new source of profit.
2. A growing part of knowledge can be codified at a reduced cost, stored and shared. This phenomenon applies to regular activities of firms but especially to the activity of innovation.

This has the following consequences for work and the internal organisation of firms.

1. An internal reorganisation of firms in order to better exploit knowledge.

There has always been an historical tendency to incorporate skills into machines and to control workers' minds. With F. Taylor (1911) the project was to implement a "scientific management" of human labour. "Time and motion" study developed directly out "scientific management" and continued as a widespread industrial engineering technique until now. The main objective was to tighten control on workers to be sure that they worked the way they were being told by engineers for the amount of work that their boss expected. In reaction, workers have always resisted strict obedience to work prescriptions, not for the mere pleasure to disobey, although it can be pleasant, but because usually work could not be done efficiently the way engineers wanted to be, or because they have found a more efficient and less tiring way to perform their job. The sociology and psychology of labour has accumulated a huge literature describing how workers invent on the job numerous ways and tricks to perform their job in a slightly but often more efficiently way. In firms where labour conditions are bad, wages low, and sometimes social conflicts are intense, this concrete way of working is usually hidden. Workers know that if they reveal their hidden knowledge, which is nothing else than implicit knowledge in the workplace, they can be punished for disobedience, or their workload can be increased without compensation. This was usually the case, with some exceptions, in western firms and in developing countries.

The first to break this status quo were Japanese firms in the 1960's and 1970's. The break-through is that the process of conversion of implicit knowledge into explicit knowledge is systematically organised and rationalised under the name of *kaisen*, which means "*continuous improvement*". Various techniques are employed: workers are grouped in teams and meet regularly under the supervision of foremen to discuss possibilities to improve the production process. This is precisely what I. Nonaka (op cit) has in mind when he argues that dialogue in an interactive context is the way to convert implicit knowledge into explicit knowledge. And every visitor of a modern Japanese firm can see how much this knowledge is codified, on charts and panels showing how to work.

It was only after the success of Japanese firms on export markets that this codification practise was progressively imitated throughout the world during the 1980's with the export of the "Japanese model" or "Toyotism" with more or less

⁸⁾ For the commodity of language we will use the term "tacit knowledge" even if we should say more precisely like T.D. Wilson (op cit) "implicit" knowledge.

success and with a lot of accommodation to local realities. Whether or not referring to the “Japanese model”, trying to capture systematically the tacit knowledge of their workers by using incentives or by constraint is now standard practise in modern firms (see part 2). In a way, we can say that it is nothing less than the pursuit of the historical tendency of substitution of labour by capital but this time one step further. The “classical” substitution of labour by capital relied on the integration of explicit knowledge (skills) embodied in workers into machines. Now late-capitalism is trying to incorporate tacit knowledge in the labour process by trying to get access to what workers know of labour but don’t tell. If we can use an image, we could say that firms would like to “download” the tacit knowledge incorporated in workers’ mind. We know that firms cannot do it completely due to the irreducible part of tacit knowledge, and because workers may not want to tell all what they know. But firms are deploying new management strategies to get all the tacit knowledge that they can get, to codify it and distribute it inside the firm to the relevant employees. The mode of production of knowledge is getting more collective and rationalised

This is why, since the second half of the last century, the pace of new management techniques quickened, even if most of them were nothing more than short-lived management fads. Knowledge management, which took off in 1997, is the most explicit management strategy which refers to the academic literature that we have reviewed to target explicitly the capture of tacit knowledge ⁽⁹⁾. It extends and transforms the concept of team into cross-functional teams to encompass all the activities of the firm. For instance, firms are changing their organisation in such a way that all internal barriers between their different departments are more permeable or even removed to facilitate knowledge sharing and interaction. Engineers from the department of R&D will communicate more directly with engineers from the department of production in order to establish a systematic interaction between the production of deliberate and codified knowledge and the production of knowledge through learning activities. The novelty is that these new teams are cross-functional and cross-divisional whereas the traditional teams in the Japanese firms were specialised units inside one function or division. Another difference is that it involves deeply office work and staff members and not only workers on the line. R. Hall (2006), relying on Australian case studies, specifies that these “...cross-functional teams are more exclusive and typically involve selected management, middle management and/or supervisory representatives from functional areas of the business”. He also stresses that both kind of teams may “... be semi-autonomous in practice but are constrained in different ways: work teams are often limited to determining task content, order, pacing and rotation. Cross-functional teams are constrained by the broader responsibility of developing and delivering a new product or service and all that entails, all marketing and market research, design and development, production, logistics, sales and distribution”. Usually, they are not given “... the freedom to develop new products, services or processes (i.e. innovation)... but they are rather charged with the responsibility of ensuring the successful development and marketing of already developed commodity” (R. Hall 2006, op cit).

9) See T.D. Wilson, op cit for a comprehensive list of management fads and a chronology of the “knowledge management” one.

He calls the employees involved in cross-functional teams “key employees”. They possess a knowledge that is critical for their company from time to time because of the strategic-organisational significance of their knowledge ⁽¹⁰⁾. These key employees are well rewarded by the company but they are progressively disempowered by the codification of their implicit knowledge: “Cross-divisional teams, “lessons-learnt programs, expert networks and mentoring program” progressively “empty” their knowledge base. They have to reinvent new critical knowledge if they want to stay key workers and not become obsolete.

What is important in these case studies is to study the fate of the other employees, those that are not considered “key employees”. Once tacit knowledge is revealed, automation, routine service, standardisation of the work processes increase. In Japanese companies, the standard operating procedures are very strict and detailed but this is also true in the Australian firms surveyed. The degree of discretion that workers enjoyed before codification is reduced. The same phenomenon is frequently observed in services especially new ones like call centres, where operators usually answer mechanically with prepared sentences that don’t always fit the question of the customer. The operators enjoy few degree of liberty in their answer and cannot spend too much time with the customer. Conversation are taped in order to control what they do and in how much time they can resolve a problem or supply a basic information. This is nothing else but the application of Taylorism beyond its traditional frontiers and to new activities. R. Hall (2006) concludes that, “... despite the rhetoric of Knowledge Management, traditional Taylorism appears to be alive and well, if not prospering”. Knowledge Management is increasing inequalities among workers and this is coherent with the polarisation of skills and jobs that we noted in the introduction.

2. A phenomenon that encompasses all economic activities, not only the so-called “high-tech” but also the wrongly called “low-tech.

According to OECD (2000, p 11), “knowledge-based industries are those which are relatively intensive in their inputs of technology and human capital”. These include aerospace, chemicals/biotechnology, ICT equipment and services, consumer electronics and the environment industry. These sectors must be regarded as markedly knowledge-based since they are immediately dependent on the use of explicit knowledge. But focusing on these sectors only would be a restrictive conception of the increasing importance of knowledge in economic activities. Not only the link between science and technology is not always far from evident, but the main flaw comes from the fact that knowledge is wrongly identified with R&D (H. Hirsch-Kreinsen, et al., 2003). This identification takes its origins in the classification of manufacturing sectors according to R&D intensity (the percentage of

¹⁰⁾ R. Hall (op cit) distinguishes “boundary spanners” senior managers who are outward-looking, conscious to developments in relevant industries and markets; “Market-facing employees”, selected sales staff, marketing staff, senior sale managers, business development officers who possess critical tacit knowledge of customers and clients; “supply chain managers” responsible for procurement decisions and the establishment of long-term relationship with important suppliers; senior operational managers with considerable experience in the organisation and able to identify “key employees” in team work.

total revenue of the firm allocated to R&D) realised by the OECD since 1986 (OECD 1986). This led originally to a three-position taxonomy and then a four-position taxonomy (high-tech, medium high-tech, medium low-tech and low-tech industries)⁽¹¹⁾ with the principal inconvenient that the high-tech sectors are very small, for instance in the USA only 15.8% of manufacturing activities meaning less than 3% of the GDP in the late nineties. In Japan and Europe it is even less (H. Hirsch-Kreinsen, op. cit). If we define knowledge as the intensity of R&D, then it is difficult to argue that knowledge is a new driving force and that we are observing the emergence of a knowledge-based economy. The reality is that the so-called Low-Medium-Tech industries such as food, fishing, wood, textiles, and car assembly may not be important producers of R&D but important users which make them very knowledge-intensive in many ways⁽¹²⁾. Because Low and Medium Technology (LMT) sectors constitute the bulk of economic activities, "... it is their performance that shape the incentives and evolution of the very high-tech sectors that are alleged to "drive" economic growth" (H. Hirsch-Kreinsen et. al, op. cit, p 25). This does not mean that high-tech sectors are not critical for the production of new technologies nor does it imply that LMT sectors are passively absorbing knowledge from outside without producing one endogenously. LMT sectors specify the technical and performance functions of the products that high-tech sectors produce. They must also develop the skills to use these high-tech products. So it is not possible to adopt a simple dichotomy such as explicit knowledge is to be found in high-tech sectors only and tacit knowledge in LMT sectors only. But it is true that LMT tends to approach technical problems in a practical way related to M. Polanyi's claim that the origin of all human knowledge is based on tacit knowledge generated through individual intuition. This knowledge is acquired through learning-by doing, empirical trial-and-error, and limited training⁽¹³⁾. It is this tacit knowledge that enables LMT to integrate and use codified and scientific knowledge produced externally by high-tech sectors, suppliers and customers and public institutions. This combination of tacit and explicit knowledge shows that the "knowledge base" in LMT is complex even if it does not show up in R&D intensity figures.

¹¹⁾ The high-tech industries are defined by a ratio investments in R&D/ total revenues > 5%; the medium high-tech have a ratio between 3% and 5%; the medium low-tech have a ratio between 0.9% and 3%; the low-tech industries have a ratio between 0 and 0.9% (OECD, 1994).

¹²⁾ H. Hirsch-Kreinsen et. al (op.cit p 22-23) give several examples. Hospitals rarely produce R&D but use very high-tech science-based technologies with a very qualified workforce. "In food processing, both production and monitoring require instrumentation technologies based on microbiology, bacteriology and informatics". Fishing, which is very important for developing countries, includes use of new materials and design concepts in ships, satellite communications, global positioning systems, safety systems, sonar technologies (linked to winch, trawl and ship management systems), optical technologies for sorting fish, computer system for real-time monitoring and weighing of catches and so on. Aquaculture includes pond technologies, computer imaging, nutrition technologies based on biotechnology and genetic research and so on..."

¹³⁾ H. Hirsch-Kreinsen et. al (op cit p 31), give the following examples : « The ability to handle daily specific product materials such as developing and processing specific steel alloys in order to prolong the life-cycle of, for instance, machines used in agriculture; the know-how and the experiences needed to guarantee the smooth running and the improvement of complex production plants; the mastering of processes and logistics in order to improve the processing flexibility and the market position of a company".

These arguments are decisive for the understanding of the restructuring of the whole range of economic activities (agriculture, industry and services) in developed countries but also in developing countries.

In developed countries, the restructuring is not so much the replacement of “old sectors” with “new” ones and the complete substitution of “old” technologies by new ones. “It evolves as a restructuring of sectoral and technological systems, transformed more from within than from without” (H. Hirsch-Kreinsen et. al, op. cit p 36, we underline). The change is not driven by activities incorporating frontline technological knowledge but by the so-called LMT industries. As we have argued previously, the new is embedded in the old.

In developing countries such as Thailand, the deepening of the industrialisation process and the pursuit of high growth certainly involves an on-going process of diversification of economic activities with the creation of new activities. But, it does not mean that the future of Thailand relies on the creation as fast as possible of high-tech sectors producing frontline technological knowledge. Not only would it be out of reach in the present situation for most of the so-called “knowledge-based industries”, but it would miss the point. The first lesson that we can draw from the experience of developed countries, is that the priority is certainly to transform from within the existing economic activities in Thailand. This supposes of course promoting scientific research in these sectors in order to be able to integrate and in some areas produce the explicit (scientific) knowledge (see above section 1.2. and 1.3). But the second lesson is that the promotion of scientific research must be articulated to the tacit knowledge already existing in the present economic activities. This means that the real priority must be given to the improvement of the quality of education and the improvement of the quality of work organisation in private and public companies (see part 2). As we shall see, quality of education and quality of work are inspired by the same theories because they involve the same principles. The command of theoretical ideas must rely on tacit knowledge.

1.2. Thai National Innovation System is lagging behind....

Developing countries have usually difficulties to create a NIS because many institutions necessary to innovations do not exist and have to appear in the process of development. Capital accumulation is also usually the main contribution to technical progress rather than accumulation of intangible assets such as knowledge and learning.

According to P. Intarakamnerd et. al. (2004), the NIS in Thailand remains weak and fragmented and does not link to its economic structural development level⁽¹⁴⁾. One may hypothesise the existence of a mismatch between its economical development and its socio-technological development that is lagging behind. The share of agriculture in GDP has decrease from 40% in the 1960s to approximately 10% in the late 1990s while that of the industry sector experienced exactly the

¹⁴⁾ We will summarise the major findings of this study. The authors base their diagnosis on the “R&D Innovation Survey 2000” commissioned by the National Science and Technology Development Agency (NSTDA) of Thailand that includes the top 200 firms, and other previous surveys. For further details see P. Intarakamnerd et. al. (2004).

reverse situation. Manufactured exports now account for more than two thirds of total exports. But most of their technologically sophisticated and high-value-added components are imported meaning that local assembly in labour-intensive plants is still dominant. Thai economic development has not led to a deepening of technological capabilities and technological learning has been very slow and passive. Only a small minority (15%) of large subsidiaries of Multinational firms and large domestic firms have capability in R&D. Beyond formal R&D, 20% performs innovations activities in a more informal way. “Most Thai firms, even large corporations, have a deep rooted attitude of not develop their own indigenous technological capabilities” and “... want to rely on off-the-shelf imported technology mostly in the forms of machinery, and turn-key technology transfer from abroad or joint venture with foreign partners”.

One interesting explanation is that Thai firms “... have tended to be short-term, very commercially oriented...” because many of them historically developed from a trading background paying attention to quick return rather than the long-term issue of development of technology capability”. In short, in Thailand stock and bond markets are not pressuring firms’ managers to increase short-term profits, but these managers do it rather spontaneously due to their commercially-oriented culture. This may be one of the reasons of the mismatch between Thai economic development and its socio-technological development. In rich countries, financial markets take their toll on the profit of productive firms and urge them to adopt short-term profit strategies, but in counterpart some financial investors finance in part R&D activities of new born firms (the so-called start-ups). In Thailand, because of the commercially-minded culture, there is only the disadvantage of the short-term focus, but not the advantage of the financing of innovative firms.

The other reasons are policy failures. Innovation has not been given high priority and is only a “buzz word” for policy makers. “There is no coherent and explicit innovation policy in Thailand” and “the industrial policy, which is also fragmented, has not paid attention to the development of indigenous technology capability as an integral process of industrialisation. Although the industry is now much more important in terms of GDP, technological activities of public “Research Technology Organisations” (RTO) dedicate more funds to agricultural sciences than for engineering and applied sciences. Few companies use their services. Unlike Singapore and Malaysia, Foreign Direct Investment (FDI) and trade policies have not been used as instruments of technological upgrading. The transfer of technology by multinational firms has been limited to the operational level so that Thai workers can efficiently produce goods. The technological spill-over has been low.

Thai universities “... have weak research culture and capabilities” and do not give much importance to science. “In 1998, Thai Universities could produce only 89 Ph.D. graduates, of which only three were in engineering”. “According to the “Science Citation Index, the number of publications by Thai Researchers is three times less than that of Singaporean researchers, whose country has a population 20 times less than Thailand”.

The elements of the NIS are fragmented because linkages are scarce. Linkages between universities and industry are weak and based on personal connections rather than organisational commitments and focused more on short-

term training and not on long-term collective research activities. Linkages between users and producers, between firms in the same and related industries, which are crucial learning activities for innovation, are also weak.

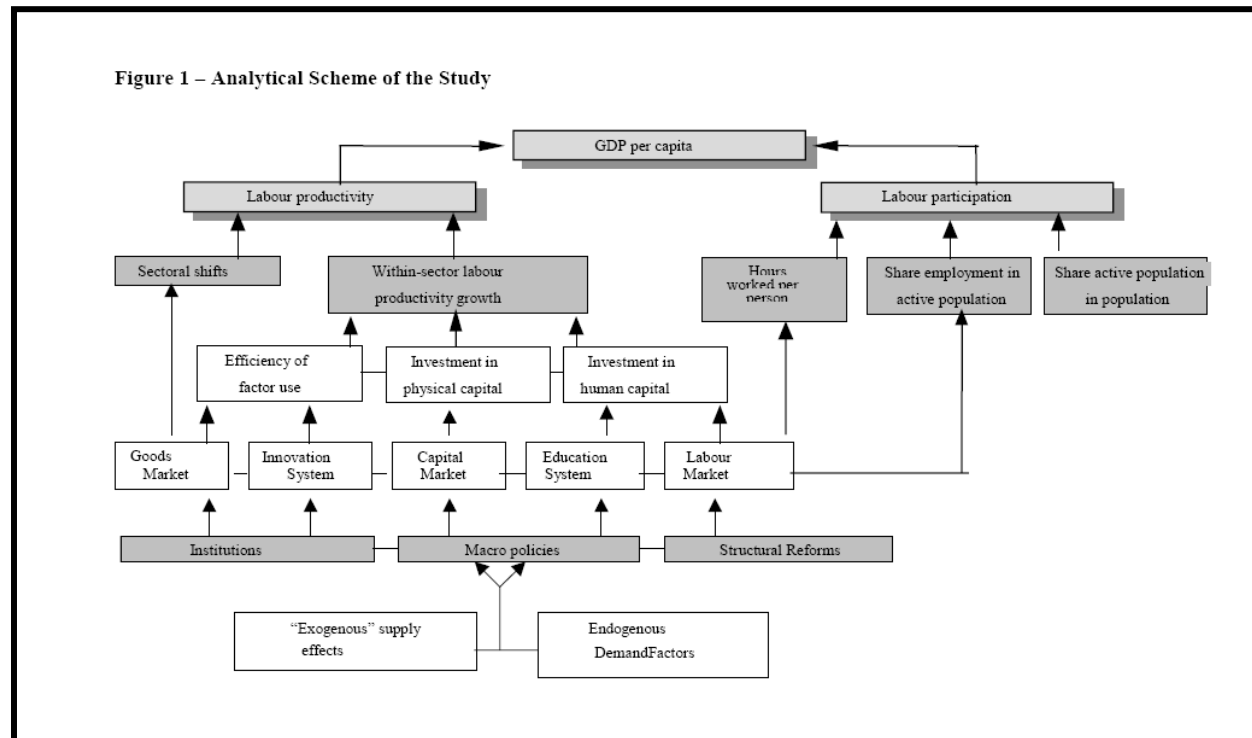
1.3. ... with negative effects on productivity.

This sombre state of things reflects in the overall efficiency of the Thai economic system calling into question the sustainability of long-term economic growth.

In economics, the efficiency of a national economy is measured by the level and rate of increase of labour productivity. The basic idea is that in theory there is no upward limit to the increase of efficiency (productivity) whereas the labour force of a domestic economy is constrained by demographic and socio-economic factors. Historically, each country has begun its process of growth by first giving emphasis to the mobilisation of its labour force. But when the labour force is fully engaged in economic activities, there is no alternative but increasing the efficiency (productivity) of the labour force if the country wants to maintain a sufficiently high rate of growth necessary to the continuous improvement of the welfare of the population. Developed countries have become rich precisely because they have achieved successfully this structural transformation from a labour mobilisation-based economy to a labour productivity-based economy.

This rationale is summarised in figure 1 which presents the whole set of economical but also social and institutional factors that influence the labour productivity and the labour participation that both determine the Growth Domestic Product (GDP) per capita ⁽¹⁵⁾. The labour participation is directly determined by the hours worked per person, the share of employment in active population (how many persons in age of working, i.e. the active population, do have a job), and the share of active population in total population (in an aging population like in Japan, the share of active population tends to decrease). The labour market determines how many people companies want to employ and how many hours do they want them to perform. The labour productivity is directly determined by sectoral shifts and within-sector labour productivity growth. The sectoral shifts usually refer to the historical shift of the active population from agriculture to industry in a first stage and then from industry to services in a second stage. These shifts are influenced by the preferences revealed on the goods market where customers expressed their demands for specific goods and services such as consumer durable goods produced by industry for instance. Because industry has been the privileged place where technical progress is more easily introduced and exploited to its full potential, it has always enjoyed a higher productivity than agriculture. As a consequence, the displacement of the labour force from agriculture to industry has been a major cause of labour productivity increase. But it is a time-limited bonus.

¹⁵⁾ This figure is taken from B. Van Ark and M. Timmer (2000) p 6. Although it is not complete and may be criticised, it is very useful to present the main determinants of the process of growth.



Source: B. Van Arkt, M. Timmer, 2000.

When the majority of the labour force is already employed in the industry, this positive effect fades away. Productivity will decrease further when the labour force shifts in great numbers to the service activity where productivity is usually lower than in industry

In this case, the only way to maintain a high growth rate of GDP per capita is to develop labour productivity within each sector (within-sector labour productivity growth in figure 1). This is a major structural change that will decide whether a country leaves the condition of a developing country to become a developed country ⁽¹⁶⁾. Within-sector productivity growth depends on the “efficiency of factor use” which is shaped by technical innovations but also organisational innovations ⁽¹⁷⁾. It also depends on investment in physical capital that embodies technical change and on investment in “human capital” () that embodies the improvements in education and skills of the labour force. More upstream in the causality process, we find precisely the innovation system and the education system. The importance of the innovation system has already been stressed before but here we see more clearly how it affects labour productivity through the efficiency in the combination of the labour force with productive capital. The education system also affects the labour productivity by providing the cognitive skills and part of the behavioural skills the economy needs. More upstream, national institutions, macro-policies be them economic or social, and structural reforms, for instance the decision to create or reinforce a social security system, determine jointly all the elements described downstream. We should of course complement this figure by taking into account such critical elements as ideology and culture and social conflicts that influence institutions, macro-policies and structural reforms and all the other downstream factors to reach a better understanding. This figure is only meant to be illustrative of the key components affecting growth, and locate where the education and innovation systems are playing their role regarding labour productivity. The arrows do not imply a one-way causation and a more in-depth analysis would detail the existing interactions.

But even this simplified representation is useful to understand the specificities of Thailand. To achieve a certain GDP per capita, a country can combine a certain level of labour productivity with a certain labour participation. To a certain extent, a low labour productivity can be compensated by a high labour participation. This is usually the case of developing countries. Or a country can enjoy a high labour productivity that mitigates a rather low labour participation. This is more desirable on a social point of view, as it means that the numbers of hours worked are reduced and workers can enjoy more free time; the share of employment in the active population can increase to reduce unemployment when it exists; and the share of active population can decrease if

¹⁶⁾ The vocabulary is tricky. There are no ideal words to define in a neutral way a “developing country” and a “developed country”, but we would like to make it clear that in our mind there is not any kind of judgement on social and cultural values of the countries involved.

¹⁷⁾ Technical innovations usually catch the attention of researchers and the public, probably because they are more visible and sometimes spectacular. Organisational innovations are not always visible and sometimes intangible, and often the forgotten factor of innovation. For this reason, (and others), one economist, H. Leibenstein (1966) had called it, the “X efficiency”, because it is unknown.

young people stay longer in the education system or if the proportion of old people increases.

Table 1 present some evidence that helps to judge the present situation of Asian countries in comparison with the USA.

The GDP per head gives an approximate evaluation of the average income of an individual living in a country, if we neglect income inequalities. It is expressed as a percentage of the United States level taken as a reference ⁽¹⁸⁾. In 1996, last year before the 1997-98 financial crisis, Thailand had reached a GDP per capita amounting to 26.1% of the US one, behind Malaysia (34.8%) and the East Asian countries (Hong Kong (China), Singapore, Taiwan and South Korea) but ahead of the other South-east Asian countries (the Philippines and Indonesia) and the South Asian countries (Bangladesh, India, Pakistan and Sri Lanka). In this year, Thai GDP per capita was more than the double of the Chinese one (11.9%). The following two variables show how this result is achieved.

The GDP per hour worked relative to the USA is a broad measure of labour productivity. In 1996, labour productivity in Thailand amounted to 17.2% of the US labour productivity. Or to put it in another way, the USA was 82.8% more productive per hour worked. Hong Kong (63.6%) and Singapore (52.6%) had the highest productivity among the Asian countries surveyed but still very far behind the USA. Taiwan (46.7%) and South Korea (37.5%), the two new industrialised countries of East Asia had a surprisingly low productivity. China, the new Asian power had a very low productivity with just 8.1% of the US level, comparable to India with 6.9%. These data shows that large productivity gaps remain even in the most representative “emerging” economies. It shows that for most countries in the region, labour productivity is not yet the driving force that provides the major contribution to growth.

The last variable, the “labour input/population” ratio represents total hours worked divided by the total population in each country in relation to the USA. This ratio accounts for the difference between comparative GDP per capita and labour productivity performance ⁽¹⁹⁾. As explained before a low labour productivity can be in part compensated by a high labour participation which is here approximated by the “labour input/population” ratio which evaluates how many hours people work on average in Asian countries. The results are striking for countries such as Thailand, China, Singapore, Hong Kong, South Korea and to a lesser extent Taiwan.

¹⁸⁾ The GDP of each country is converted to US dollars on the basis of purchasing power parities for 1990 or any other latest benchmark available to ensure that the evolution of the exchange rate does not biased the comparisons. In 1996, the GDP per capita in the USA was US\$ 23,634 and in 1998, US\$ 25,159.

¹⁹⁾ The relative difference in per capita income, GDP/Population, between two countries (X and the USA) can be expressed as the relative difference in labour productivity, GDP/Hours worked times the relative difference in Hours worked per person, Hours worked/Population:

$$\left(\frac{GDP}{Population} \right)^{X-USA} = \left(\frac{GDP}{Hoursworked} \right)^{X-USA} \times \left(\frac{Hoursworked}{Population} \right)^{X-USA}$$

Table 1. GDP per Capita, GDP per Hour Worked and Employment/Population Ratios, Asia, as a % of the United States, 1960-1998

	Bangla- desh	India	Pakistan	Philip- pines	China	Sri Lanka	Indo- nesia	Thai- Land	Malaysia	South Korea	Taiwan	Singapore	Hong Kong
<i>GDP per head of the population (as % of the United States)</i>													
1960	4.8	6.6	5.9	13.3	6.0	14.8	10.1	9.2	14.0	11.6	12.5	18.5	25.7
1973	2.9	5.1	5.9	11.8	5.1	10.1	9.3	10.5	17.6	17.1	22.1	32.3	42.1
1980	3.0	5.1	6.3	13.7	5.8	11.6	10.2	13.1	22.3	22.5	30.8	44.6	56.2
1987	3.2	5.5	7.0	10.3	8.2	12.5	10.4	14.8	22.5	34.0	42.2	50.5	73.1
1996	3.4	7.0	7.8	10.3	11.9	14.5	15.6	26.1	34.8	52.6	57.2	80.6	88.2
1998	3.5	7.0	7.5	9.8	12.4	14.8	13.0	21.7	31.5	47.0	57.5	80.3	78.6
<i>GDP per hour worked (as % of the United States)</i>													
1960	4.6	5.3	5.8	11.6	4.6	13.4	9.9	5.8	14.0	12.7	10.0	13.2	31.4
1973	3.2	4.9	6.3	11.1	3.9	9.9	9.4	7.6	17.6	15.4	16.5	25.8	29.5
1980	4.6	4.7	6.9	13.1	4.4	12.8	9.5	8.8	20.6	17.6	22.4	30.0	38.4
1987	4.0	5.2	8.4	9.7	5.8	13.8	8.6	9.9	21.0	25.0	30.7	36.3	49.5
1996	4.0	6.9	10.2	9.1	8.1	17.2	12.5	17.2	30.3	37.5	46.7	52.6	63.6
1998	4.0	7.1	10.0	8.8	8.6	17.9	10.3	15.5	27.6	37.2	48.8	51.6	57.3
<i>Labour Input/Population Ratio (as % of the United States)</i>													
1960	103.7	124.4	102.5	114.9	130.1	110.9	101.9	158.9	100.1	91.5	125.2	140.6	81.7
1973	90.0	105.4	94.2	106.0	129.6	102.2	98.7	138.9	99.7	111.3	133.9	124.9	142.5
1980	66.4	109.7	92.3	104.9	132.0	90.4	107.8	148.8	108.3	127.9	137.4	148.3	146.2
1987	79.7	107.2	83.2	106.0	141.1	90.1	121.1	150.0	107.1	136.3	137.8	139.1	147.7
1996	86.4	101.6	76.8	113.2	146.6	84.0	125.1	151.8	115.0	140.4	122.4	153.1	138.6
1998	85.5	99.7	75.6	111.0	144.6	82.9	125.6	140.1	114.1	126.5	117.9	155.6	137.2

Source: GGDC Total Economy Database (see Appendix)

Source: B. Van Arkt, M. Timmer, 2000.

In these countries people worked on average 50% more than in the USA in 1996. This does not fill the productivity gap, but without these long hours performed by workers of these countries, the GDP per capita would be lower still. This characteristic is not found in South Asian countries where under-employment prevails, which combined with lower productivity explain their low GDP per capita. At the same time the evidence found in countries such as Thailand reveals the limit reached by the phenomenon. The demographic growth is slowing, and the number of youngsters is decreasing so that the projection for population growth suggests a decrease in the share of the working age population in the total population. On the top of that, it is unlikely that working hours can increase further in Thailand beyond their current level because workers already work at least 6 days a week, 10 hours per day as a minimum. Unless one imagines that workers could work 7 days a week and more than 10 hours a day with no vacations without endangering their life, it is easy to see that a sustainable growth, on a social and even economical point on view must now rely on improvements of labour productivity.

1.4. Can this improvement come from sectoral shifts?

The answer is presently positive as far as Thailand is concerned. B. Van Arkt and M. Timmer (2003) provide evidence that during the period 1963-73, the migration from agriculture to industry and services (the shift effect) contributed to 32% of the total increased in labour productivity while the improvement of productivity inside each sector (the intra-effect) contributed to 68% of total labour productivity (see table 2, column 3). The shift effect increased a little up to 37% during the period of 1973-1985, but a lot during the most recent period 1985-96 up to 65% ⁽²⁰⁾. This is because in Thailand, the shift from agriculture to industry and services has begun later than in other more advanced Asian countries or even Malaysia, so that the full effect on productivity appeared lately, like in Indonesia. Thailand can still benefit from a positive shift effect on productivity in the near future, because its structural change is probably not completed. In 1996, agriculture still accounted for more than 50% of the labour force. But the potential is decreasing quickly. During the first half of 2006, agriculture share of the labour force had already dropped to 37% ⁽²¹⁾. Even if this share stabilise around 30%, the shift effect can no longer be a source of labour productivity improvement for the future especially because the decrease of the agricultural share benefit much more the services share (which have a low productivity) than the manufacturing

²⁰⁾ Assuming that a worker that leaves the agriculture for industry, for instance, has the same average productivity than a worker already working in the industry ($e = 1$ in column 3). If we assume that the worker who leaves agriculture is underemployed because of a surplus of labour in agriculture, one may assume that his productivity is 30% lower than that of an industrial worker ($e = 0.7$, column 4). When he finds a job in industry, he will increase productivity by 30%. In column 5, his productivity is 70% lower, and in column 6, his productivity is equal to zero, meaning that he was totally unemployed ($e = 0$). For the period 1985-1996, the shift effect varies from 67% to 73% when e varies from 0.7 to 0.

²¹⁾ Calculated from the Labour Force Survey of the National Statistical Office. The share of manufacturing in the labour force has stagnated around 16%, and the share of services has increased to 46.4% during the first half of 2006.

share (which have a higher productivity). So in any case, future labour productivity in Thailand has to come from the inside of industry and even services. Figure 2 shows that it is not the case yet, with intra-productivity effect in manufacturing accounts for less than 1% for the period 1985-2001, the productivity in services being negative. But if Thailand wants to follow the paths of the more advanced Asian countries, the conclusion is that it will now have to increase its labour productivity in manufacturing activities.

Table 2: Decomposition of aggregate labour productivity growth in Asian Economies

	Labour productivity growth (annual)	Percentage of labour productivity growth explained by:				
		No Adjustment for surplus labour in agriculture ($e=1.0$)		Shift effect with adjustment for surplus labour in agriculture		
		Intra- effect	Shift effect	$e=0.7$	$e=0.3$	$e=0$
India						
1963-73	1.9	111	-11	-11	-11	-11
1973-85	1.4	75	25	25	25	25
1985-96	4.0	103	-3	-3	-3	-3
Indonesia						
1973-85	3.1	67	33	34	34	35
1985-96	2.6	59	41	46	53	58
Japan						
1963-73	7.1	86	14	15	17	18
1973-85	2.8	88	12	13	15	16
1985-96	1.9	88	12	14	15	16
Malaysia						
1976-85	3.7	59	41	42	44	45
1985-96	3.7	85	15	19	25	29
South Korea						
1963-73	4.7	83	17	18	18	18
1973-85	4.6	69	31	36	42	47
1985-96	4.6	89	11	12	15	16
Taiwan						
1963-73	5.7	80	20	21	22	22
1973-85	4.1	91	10	11	12	13
1985-96	4.5	94	6	6	7	7
Thailand						
1963-73	4.9	68	32	32	32	32
1973-85	2.8	63	37	40	44	47
1985-96	6.5	35	65	67	71	73

Note: Decomposition of labor productivity growth into part due to labor productivity growth in sectors (intra-sector effect) and shift of labor between branches (shift effect) using equation (10) on two sectors, shifting the base annually.

Source: B. Van Arkt, M. Timmer, 2003.

1.5. What is the contribution of education to the labour productivity increase?

To answer this question, one has to separate the effect of improvement of the quality of labour due to education from the quantity of labour used in the economy. There is no simple and undisputable way of doing it. Those who have attempted the exercise try to decompose the growth output (the GDP growth) into the contribution of the volume of labour and the volume of capital used ⁽²²⁾. Usually, the volume of labour and capital used to produce the output does not explain 100% of the GDP growth. There is always a “residual” that represents the “efficiency of factor use” also called “Total Factor Productivity” (TFP) (see Figure 1). The interpretation of this TFP is highly disputed in economics ⁽²³⁾, but in our perspective, the TFP includes technical change and advances in knowledge as we have defined it previously such as the R&D national capabilities, the skills embodied in workers and entrepreneurs that enable them to learn and master new technologies, to develop and implement organisational innovations, and all the learning activities occurring during work and economic activities. To summarise, the progress in overall efficiency of an economy (the so-called TFP) is due to an interaction between embodied progress (in particular the Information and Communication Technologies such as computers, Internet and so on) and disembodied progress, in the form of new knowledge.

To assess the contribution of improvements in skills due to education, it is therefore necessary to separate them from the other factors that improve the TFP. For this purpose, labour force data has to be classified according to age, sex and level of education that together represent the quality of the labour force. This has been done by A. Chandrachai, T. Bangorn and K. Chockpisansin (2004) in Table 3. One can see that on average during the whole period ranging from 1977 to 1999, 83.4% of the Thai labour force had only up to the primary level (43.8% being male and 39.6% being female) ⁽²⁴⁾; 8.9% had (general/academic) secondary level; 2.3% had (secondary) vocational level; and 5.4% had superior level. If we compare the first period 1977-81 with the last one, 1997-99, we observe that the share of employment with only the primary level has decreased from around 92% to 72% to the benefit of the share of the second

²²⁾ This is called the “growth accounting method” pioneered by economists such as Solow, Abramovitz, Denison and Jorgenson.

²³⁾ The debate opposes proponents of accumulation theories (accumulists) and proponents of assimilation theories (assimilists). The accumulists follow the neo-classical theory and argue that investment is a sufficient condition for growth and that capital intensification is an automatic and effortless shift along a well-known global production function. “Less-developed countries can adopt technologies practised at the world technology frontier without the need to devote resources to the development of these technologies themselves”. Assimilists stress the effort which is necessary to master technologies unknown to developing countries. Capital intensification is real search for an enlargement of the set of production capabilities. Investment in machines must be complemented by “soft investments in organisational change, developing of managerial skills and creating of knowledge of new product and process technologies”. (See M. Timmer, 2002)

²⁴⁾ After checking it appears that this figure includes in fact, employed persons with incomplete elementary school and those with completed elementary school, which make things worse on a quality of education point of view.

general/academic level which has increased from 4.5% to 15.6%. The share of secondary vocational school has remained stable, while the share of the high level (teachers and university graduates) has increased from 2.4% to 9.2%. So, on the whole, there has been a significant increase in the level of education of Thai employees, even if the share of those with secondary level and vocational school added to the tertiary level remains low, no more than 28% of the labour force ⁽²⁵⁾.

Table 3. Distribution of share of employment classified by level of education, 1977-95.

Period mean	Primary		Secondary		Vocational		Teacher & university	
	Male	Female	Male	Female	Male	Female	Male	Female
1977-81	47.44	44.34	3.31	1.21	0.74	0.53	1.40	1.03
1982-86	45.68	42.43	4.33	1.69	1.18	0.81	2.22	1.67
1987-91	44.42	40.01	5.48	2.51	1.48	0.97	2.74	2.38
1992-96	42.08	37.43	7.24	3.83	1.62	1.05	3.54	3.21
1997-99	38.70	33.48	9.76	5.92	1.82	1.15	4.67	4.5
1977-99	43.76	39.63	5.95	2.96	1.38	0.91	2.89	2.53

Source: A. Chandrachai, T. Bangkorn, K. Chockpisansin, 2004.

The effect of this increase in education is presented in Table 4 (adapted from A. Chandrachai et. ali., 2004). During the whole period of 1978-99, which includes the crisis years of 1997-98, the Total Factor Productivity (TFP) including the effect of the improvement of labour quality reached 1.26% per year. Without the improvement of labour quality, it would have been only 0.52% which confirms that the TFP in Thailand has been quite low. In other terms, the quality of labour increased the TFP by 0.74% point. We can also say that the improvement of the quality of labour due to the increase in education amounted to 58.7% of the TFP. The contribution of the education system was in fact quite high. When we look at the sub-periods, we can observe that the contribution of the labour quality was close to zero at the turn of the seventies, when the enrolment in secondary school was still very low with 4.5% of the labour force. The contribution of the quality of the labour force increased a lot in the eighties and nineties when the enrolment in the secondary school began to increase substantially.

²⁵⁾ There has been an on going improvement since then. During the first half of 2006, the share of the employed people with no education (3.6%), incomplete (34.1%) and complete primary (21.7%) dropped to 55.7%, to be compared with the 72.2% share during the period 1997-99. Those with lower and upper secondary level accounted for 26% of the total, and the higher level share amounted to 14.2%. Calculated from the "Report of the Labour Force Survey, NSO, 2006.

TABLE 4: THE CONTRIBUTION OF LABOUR QUALITY TO TOTAL FACTOR PRODUCTIVITY (TFP)				
PERIOD MEAN	TFP INCLUDING LABOUR QUALITY	TFP EXCLUDING LABOUR QUALITY	Contribution of labour quality	IN % OF UN TFP
1978-81	1,18	1,10	0,08	6,78
1982-86	1,75	0,87	0,88	50,29
1987-91	3,93	3,12	0,81	20,61
1992-96	1,70	1,05	0,65	38,24
1997-99	-4,60	-6,04	1,44	-31,30
1978-99	1,26	0,52	0,74	58,73

Note: all variables expressed in % of the average rate of growth for the period, except the last column which expresses the labour quality in % of the TFP including labour quality,
Source: adapted from A. Chandrachai et al, op cit page 2004,

Of course, this measure of the contribution of the education system is approximate, because it is based on quantitative measures only, when the main problem of the Thai education system is the quality of education. The generalisation of primary and secondary school is of course a progress in quality in comparison with previous generations, because it means that basic cognitive skills (reading, writing and calculating) have dramatically improved. But this does not mean that universal basic skills mastering is fully achieved. According to the report "Education For All Global Monitoring" of the United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2005), more than three million Thais (8% of Thailand's adult population aged 15 and above) have no basic reading and writing skills and another one million students are left out of the school system. Although government figures put the adult literacy rate at 92.6%, an assessment by the OCDE found that 37% of 15-year-old students were performing at a level indicative of very low reading abilities. In mathematics, the OECD report found that only 40% of the 15-year-old student population had basic maths skills.

Therefore, it is not plausible to say that any further progress in secondary and higher level enrolment is automatically a progress in the same proportion of the quality of the labour force because of the logic of the Thai education system. To use Anne Booth's words (2003), one may find "... a rapid expansion of low-quality "diploma mills" in Thailand, the Philippines and Indonesia, and indeed in Japan and South Korea as well". To summarise, the contribution of the quality of the labour force due to education is overestimated in a general context where the total Factor Productivity of Thai economy is low, especially in manufacturing where productivity should be the driving force ⁽²⁶⁾.

²⁶⁾ According to A. Chanchadrai et al, (op cit p 306) TFP in Thai manufacturing has been negative, -1.14% per year on the whole period 1977-99, even during the last period preceding the crisis, with -1.37% during

2. The consequences on education and employment.

Scientific debate about education theories and the link between education and employment has existed long before the advent of globalisation and the “knowledge economy”. In developing countries, education has long had a particular responsibility in the development and catching up process (see section 2.1). But as for other topics, globalisation has transformed the existing debate because of the new economic demand addressed to education. Education must not only carry on its traditional role of an instrument of state formation, promotion of social cohesion and transmission of national cultures and contributes to development. Now it must also turns into an instrument for coping with globalisation. This is a source of tensions insofar as globalisation tends to increase social inequalities contradicting the objective of social progress promoted by education. This contradiction is sharp in most developed and Latin-American countries where growth has slowed down and poverty increased. In Thailand inequalities have also increased but in a context of nearly-disappearance of extreme poverty and full-employment thanks to the sustained high-growth. This creates room of manoeuvre to deal with social tensions in a specific way that some may call the “Thai way”. Solutions and compromise are not found through open conflicts which are rarely “voiced” to use Hirschman’s concepts (1970), because people vote with their feet by changing of employers or/and regions (they exit). This is why Thai policy makers, which have acknowledged these tensions since the 1992 Education scheme, may find a balance between economic competitiveness and traditional Thai values of “self-control and self-discipline, modesty and moderation” (J. Witte, 2000, p 233-235). As long as full-employment is sustained the contradiction can be solved. Self-control, self-discipline, modesty and moderation are values highly praised by private companies especially those engaged in the taylorist division of labour where work is repetitive, boring, low-skilled, and badly-paid. But for private companies engaged in the cognitive division of labour, these values are insufficient and must be completed by “new values” which in fact are essentially behavioural skills such as problem-solving and decision-making skills even at lower levels of hierarchy. At the world level, employers are asking the education system to develop these behavioural skills. This demand entails strong consequences for the education system: not only privatisation and biased decentralisation, not only vocationalism at the expense of general education (see A. Mounier, 2007) but also a perversion of educational reform. Late Capitalism is smart enough to misappropriate certain theories of education to divert them to its benefit. This is why theories of education have to be considered and assessed not only in the school context, but also in the broader social and economic context (see section 2.2).

1992-96. P. Tinakorn, C. Sussangkarn, (1996) found that in the period of 1978-1990, the growth rates of TFP in manufacturing and industry were -0.36% and -0.61% respectively

2.1. The increasing role of education for catching up.

Education and training policies have always been important to foster development. But in the new ICT paradigm, education acquires a renewed importance for international competitiveness because it creates and reproduces national R&D capabilities and absorptive capabilities. Even if a developing country policy makers have no ambition to create research capabilities to be on the frontier of innovation, they should at least invest in education and training policies to develop absorptive capabilities to sustain the catching up process or just to keep in pace.

What role can play the education system to help climb up the ladder? The answer to this question faces two difficulties.

The first relates to the conception attributed to the education system. The first mission of the education system is to form citizens able to live in society. This presupposes that the education system is not subordinated to the economic system, the state, religions and families. Without this autonomy, the education system cannot educate, i.e. transfer cognitive skills to youngsters and give them the possibility to think on their own by exercising their critical mind. Without this freedom of thinking and of criticism there is no real scientific progress or progress of knowledge whatsoever. This does not mean that the education system must ignore the economic system, because one day or another, youngsters have to find a job. But this means that the best contribution the education system can do to the economy is to provide future workers with the highest possible cognitive skills. The specific skills that firms needs can only really be learnt inside firms by training and learning by doing. This does not mean that an interaction between theoretical knowledge taught at school and the practise on the job is not necessary especially for certain professions (such as physicians, surgeons, nurses, lawyers, engineers...and teachers). But this means that the cognitive skills taught at school must not try to match narrowly what firms say their needed skills are. Not only firms have difficulties in defining what skills they need, but it appears that they are usually satisfied with the cognitive skills their workers have learnt at school. Their demand concerns in fact “behavioral skills”, or to put it more simply, the attitude of their workers such as “punctuality, loyalty and discipline” (G. Lafer 2004, p 111). Giving emphasis to “behavioural skills” in the education system would be contradictory to the necessary autonomy of the education system to the expense of the learning of cognitive skills.

The second difficulty is precisely to define and organise the relation of the education and economic system. If the education system is too ahead of the economic system, the risk is that lot of high skilled people will not find a job where they can exercise their skills usefully and learn more. This will be a waste of skills generating social frustration. If not exercised, skills tend to disappear. If the education system is lagging behind the economic system, then there will be a shortage of skills and economic growth will decrease. The solution is for the State to try to plan and synchronise the education and the economic system, even if it is difficult to imagine that the two systems will always match perfectly. This means that the education policy must be conceived together with an

industrial policy with the ideal of a fine-tuning that preserves education autonomy.

As explained by M. Timmer (2002, p 53-54), “the process of moving up the technology ladder in order to sustain productivity growth... only keeps its momentum by a continuous introduction of new activities and technologies” ⁽²⁷⁾. Once knowledge accumulates thanks to learning by doing in an existing set of technologies and products, the possibilities to learn further decreases along time, and with it productivity. But this structural change is only possible if the education system provides the necessary cognitive skills. This means that in developing countries, it is better to invest heavily in education even if the education system is a bit ahead of economic development.

2.2 Knowledge-based economy and its impact on education policy and theories of learning.

Because knowledge implies a cognitive activity, the increasing importance of knowledge in late capitalism should lead to a growing role of the education system whose main function is precisely to teach cognitive skills. This may appear as a truism because many governments in developed and developing countries have publicly announced that high quality education for all is a national priority to be able to cope with the new challenge posed by the “knowledge-based economy”. But for most of them, this does not mean strengthening the education system in its main mission to teach cognitive skills, but to subordinate education to the demands of the business sector. In their mind this implies reducing the general curriculum in favour of vocational school, and improving the quality of education by focusing on reading, writing and arithmetic to be sure that at least “basic skills” are secured. These two objectives are theorised by two powerful institutions in developed countries, the OECD ⁽²⁸⁾ which has sponsored the concept of the knowledge economy” and the European Union which has adopted the official objective to turn Europe into a “learning economy”. “Basic skills” is a common and narrowly defined core, whose effectiveness is measured by international comparisons. In Italy, S. Berlusconi, the previous prime minister has supported an educational reform that shows clearly how basic the targeted skills are. “The new purposes of Italian Education are understood under the heading of the 3 “I”: Impresa, (in English “business”), Informatica (computer), Inglese (English). But it is in England that the project is most detailed and

²⁷⁾ We would add that in the new international context, moving up the technology ladder is also a necessity due to the new “cognitive division of labour” that we have described above.

²⁸⁾ The Organisation for Economic Co-operation and Development (OECD) was founded in 1947 and groups 30 member countries, mostly developed countries, that “share the principles of the market economy, pluralist democracy and respect for human rights”. “Its work covers economic and social issues from macroeconomics, to trade, education, development and science and innovation” (see OECD website home page). It is actually a think-tank of neo-liberal social and economic policies such as privatisation, generalised competition, against the welfare-state, minimum wage and taxes.

advanced: primary schooling is dominated by “National Strategies” for Literacy and Numeracy which - according to T. Blair’s advisors – should occupy more than 50% of the school timetable” (N. Duceux, K. Jones, 2006, p 101). One can observe the same project in France, Spain and Germany and this convergence of education policy is not a coincidence nor serendipitous. “The objective is the creation of a common and standardised curriculum at the European level“. For instance the EU Commission began the work of identifying “new basic competences” and “future objectives” of national education systems” in the knowledge society” (K. Jones, N. Duceux, 2006, p 96). The OECD with its international PISA system of performance indicators and the EU with its battery of 16 “quality indicators” (EU 2000) of member-states education system (EU, 2001) are in charge of evaluating the performance of each national education to lend authority to neo-liberal reform. It will be possible for some education system to demonstrate rising levels of attainment which legitimate their government. But it is dubious that this will reflect a real improvement of quality in education and a better chance for students to find a good job. In developed countries at least, the objective of “basic skills” is an impoverishment of education in a general context of underinvestment in education. In England, where this neo-liberal reform has been deeper engaged, the results are disappointing. The PISA performance has improved between 1998-2003 but have since levelled off and “far from encouraging and extending pupil contribution to promote higher levels of interaction and cognitive engagement, most of the teachers’ questions were of a low cognitive level designed to funnel pupils’ responses towards a required answer” (F. Smith et al, 2003, quoted in K. Jones and N. Duceux, op cit).

Not only are the objectives assigned to education impoverished but also the mere concept of learning. D. Guile (2001, p 470) argues that “current EU and UK policies are based upon an impoverished concept of learning that only understands learning as the acquisition pre-existing knowledge and skill”.

Our purpose is not to engage deeply into the debate that opposes different tenants of theories of learning. A. Sfard, (1998) synthesises this debate by distinguishing what she calls the “Acquisition Metaphor” (AM) and the “Participation Metaphor” (PM) to show their strong points but also their limitations and flaws ⁽²⁹⁾.

The AM represents the traditional concept of human learning which is conceived of as an acquisition of something. Various theoreticians like J. Piaget and L. Vygotsky belong to this tradition where the growth of knowledge in the process of learning has been analysed in terms of concept development. “Concepts are to be understood as basic units of knowledge that can be accumulated, gradually refined, and combined to form ever richer cognitive

²⁹⁾ “ ...Bringing to the open the tacit assumptions and beliefs that guide us... means digging out the metaphors that underlies both our spontaneous everyday conceptions and scientific theorizing” (A. Sfard, op. cit. p 4). “Scientists use metaphors as figurative representations to explain the process that turns old knowledge into new knowledge. In this sense, the notion of metaphor complements the view of theoreticians of intellectual development from Piaget to Vygotsky which holds that new knowledge germinates in old knowledge”. A. Sfard (op cit) applies this approach to theories of learning in order to embrace them at a glance.

structures” A. Sfard, op. cit. p 5) ⁽³⁰⁾. This does not mean that these theoreticians cannot have disagreements between them. For instance, L. Vygostky’s theoretical framework is first of all a theory of *social* development where interaction plays a fundamental role in the development of cognition. Against J. Piaget, he argues that “the earliest speech of the child is ... essentially social... Egocentric speech which emerges when the child transfers social, collaborative forms of behaviour to the sphere of inner-personal psychic functions... The true direction of the development of thinking is not from the individual to the socialised but from the social to the individual” (L. Vygostky, 1962, chapter 2). Researchers may oppose on the individual versus collective dimension and other ones about how learners develop concepts and acquire knowledge but they implicitly agree on the idea of learning as gaining possession over some commodity (A. Sfard, op. cit. p 6).

The PM stresses that learning activities can never be separated from the context within which they take place. The learner is viewed as a person interested in participation in certain kinds of activities rather than in accumulating private possessions as in the AM. Learning is now conceived as of a process of becoming a member of a certain community. This entails the ability to communicate in the language of the community and act according to its specific norms. The role of the teacher is to preserve the continuity of the community. As A. Sfard puts it (op. cit. p 6), the learner who was a “lone entrepreneur” in the AM “turns into an integral part of a team”. The theory of situated learning (J. Lave, E. Wenger, 1991) is the best representative of the PM. Learning occurs in the relationships between people when they form a “community of practice”. A community of practise can have names or not and can be formal or informal. But their members must have in common a shared practice which is the basis of their collective learning ⁽³¹⁾. A community of practice can be a classroom, even a school, people with whom we work, home, a sport club, a NGO, a trade union or a political party. Learning does not take place only at school. “A community of practice involves also much more than the technical knowledge or skill associated with undertaking some task. Members are involved in a set of relationships over time”. “The fact that they are organising around some particular area of knowledge and activity gives members a sense of joint enterprise and identity” (M. K. Smith, 2006). Based on case-studies of how newcomers learn in various occupational groups which are not characterised by formal training, they suggest that “legitimate peripheral participation” is the key to learning. Legitimate peripheral participation can be summarised as the following:

³⁰⁾ The contribution of L. Vigostky (1896-1934) with his theory of the “zone of proximal development” shows that the process of engagement of children with the adult enabled them to refine their thinking and make it more effective.

³¹⁾ In this sense a community of practice is different from a community of interest or a geographical community which don’t have necessarily a shared practice.

- “It is legitimate because all parties accept the position of “unqualified” people as potential members of the “community of practice”.
- Peripheral because they hang around on the edge of the important stuff, do the peripheral jobs, and gradually get entrusted with more important ones.
- Participation because it is through doing knowledge that they acquire it. Knowledge is situated within the practices of the community of practice, rather than something which exists “out there” in books” (see J.S. Atherton, 2005).

A. Sfard summarises these two metaphors with the following mapping (see table 5).

Acquisition metaphor		Participation metaphor
Individual enrichment	Goal of learning	Community building
Acquisition of something	Learning	Becoming a participant
Recipient (consumer), (re-)constructor	Student	Peripheral participant, apprentice
Provider, facilitator, mediator	Teacher	Expert participant, preserver of practice/discourse
Property, possession, commodity (individual, public)	Knowledge, concept	Aspect of practice/discourse/activity
Having, possessing	Knowing	Belonging, participating, communicating

Anna Sfard, (1998) "On Two Metaphors for learning and the Dangers of Choosing Just One". Educational Researcher, Vol. 27, N° 2, p 7.

She then reaches the conclusion that each metaphor considered independently has its own flaws leading at best to cul-de-sac or worse to dangerous consequences⁽³²⁾. At the same time each has a relative advantage. The conclusion is that we cannot rely on only one metaphor and the solution is “to live with both of them, the tension between two seemingly conflicting metaphors being the best protection against theoretical excesses and a source of

³²⁾ “In class-ridden capitalist society, for example, knowledge understood as property is likely to turn into an additional attribute of position and power. Like material goods, knowledge has the permanent quality that makes the privileged position of its owner equally permanent” (A. Sfard, op cit p 8). As for the Participation Metaphor, which theoretically has the potential to lead to a more democratic practice of learning and teaching, we will see below that its pre-emption by the business sector can lead to the contrary.

power” (op. cit. p 10). The two metaphors are incommensurable but not incompatible⁽³³⁾.

Taking stock of this conclusion D. Guile (2001) defines learning as a process of “acquisition and participating”. He stresses that if cognitive skills acquired at school are rich and relevant, they are insufficient to enable future workers to cope with different contexts and jobs if students don’t learn at the same time “to relate theoretical and practical modes of learning to one another to enable connections to be made between workplace and formal learning” (D. Guile, M. Young, 1999). In other words, future workers cannot rely on existing schema and available routines to interpret problematic situations but must learn “... how to mediate and debate ideas or concepts which might form the basis of new ways of addressing the evolving range of cultural, economic and social problems.” (D. Guile, 2001). This puts at the centre stage the concept of transfer, i.e. the capacity to carry knowledge across contextual boundaries⁽³⁴⁾.

We think that these authors are fundamentally right in trying to reach a balance between acquisition and participation, i.e. pre-existing knowledge and situated learning.

But we would add that the capacity to transfer the knowledge acquired at school to other contexts (be it the workplace or others) depends crucially on the development of a critical and therefore autonomous mind at school on one hand, and on a reconsideration of a curriculum far more ambitious than “basic knowledge” and based on the principle of polyvalence and transdisciplinary knowledge on the other hand.

The best contribution that the education system can provide to citizens and to economy is to maintain and reinforce a common curriculum for all students as long as possible, for instance until the age of 18, with a strong cognitive skills content and to postpone specialisation into more specific technical skills thereafter. This guarantees that workers will have the capacity to move from one job to another by reemploying their cognitive skills in a new context. By definition, if their cognitive skills base is too small because they have been specialised too early into specific technical areas, they will be unable to adapt to a new job. But this is not sufficient.

Vygotsky’s social theory of learning must be adapted to the new context of the learning economy and combined with the theory of situated learning. It is coherent on an epistemic ground, since both theories share the same emphasis on the social dimension of learning. This means that cognitive skills can no longer be conceived only at the school field when children are engaged in the process of learning. The same didactic of proximate development has to be extended to the work place and all other “communities of practice”. This means that inside communities of practice such as they were defined, learning with

³³⁾ “... Incommensurability means that there is no super-theory that provide tools for proving one framework is right while refuting the other. This is certainly the case with the controversy over our two metaphors for learning: there is no possibility of solving this type of conflict with a scientific argument, as it is traditionally understood” (A. Sfard, op. cit. p 12).

³⁴⁾ “Our ability to prepare ourselves today to deal with new situations we are going to encounter tomorrow is the very essence of learning. Competences means being able to repeat what can be repeated while changing what needs to be changed” (A. Sfard, op. cit. p 9).

peers must ensure that newcomers become progressively autonomous in the process and be able to learn by themselves the proximate knowledge.

In a way this is what private firms are trying to do. They have perfectly understood the importance of the theory of situated learning and especially the importance of concepts such as “communities of practice” and “legitimate peripheral participation”. The reason is that the theory of situated learning turns operational M. Polanyi’s concept of tacit Knowledge and I. Nonaka’s theory of knowledge creation. I. Nonaka was the first to understand that turning part of tacit knowledge into explicit and perhaps codified knowledge, involve a dialogue inside a team. What the theory of situated knowledge adds, is that these teams should be “communities of practice”. The new hype in knowledge management literature is precisely now “legitimate peripheral participation” and “communities of practice” and through the intermediary of these management consultants, these concepts are breaking into the corporate world. This is very interesting to observe how theories and concepts that were developed in the context of learning at school are now imported by private firms to learn at work. In this process, there are two difficulties:

1. Communities of practice are formed spontaneously by workers, because they work together or because they perform the same job even if they work individually. This involves a strong process of social relations leading to the creation of an individual and collective identity, which is the base of relationships based on trust and solidarity. These communities of practice can fit with teams and functional or cross-functional groups designed by the formal organisation of the firm, but not always. In particular, a community of practice may emerge spontaneously after the firm has established its functional organisation and various departments, groups and teams. But it is not an automatic process but a complex and uncertain one. So it is hard to imagine that communities of practice can be easily operationalize in the following way: “Ok, we the managers, have created a cross-functional group, now you employees must create a community of practice to reveal your tacit knowledge, codified it and share it for the sake of your company”. Of course, we are caricaturing on purpose, but this is to show that all a smart human resource department can do, is to bring together the necessary conditions for the creation of communities of practice and hope that it will work and fit with the organisational chart.
2. One of these conditions is to give and preserve the autonomy of the communities of practice. And this is a difficult objective. Private firms are hierarchical organisation where power is exercised and social interests are diverging. Giving autonomy to workers, and in this case communities of workers, is always a tricky operation. As explained by T. Coutrot (1998), autonomy has to be controlled. Too much autonomy could give too much power to workers and put them in a position where they can resist to the intensity of work and bargain their way in

the company. The knowledge that communities of practice can produce can also be of no interest to companies when they don't result in improvement of efficiency. The sociology of work is full of example where companies have purposely refuse suggestions because it would have given too much power to workers. For instance, workers can be able to improve the software that command robots or other numerically controlled machines. But this concrete tacit knowledge codification can be hard to accept by engineers and managers because their prerogatives could be in danger (H. Shaiken 1984). This question of power and social conflict are the black holes of the literature on organisational learning and knowledge management.

2.3 The consequence for employment.

A. Lam's work is very helpful to conceptualise the relation between knowledge, labour market and employment. According to A. Lam (2000), labour market and the nature of employment relationship influence the "knowledge base" and the learning capabilities of firms in three ways. First they determine whether skills are determined inside or outside the firm, hence the relative importance of formal education and training vis-à-vis employers. Second they determine career mobility and incentives for workers and the possibility for firms to acquire and accumulate different types of knowledge. And third they shape the individual's career and social identity and define the boundary of knowledge.

She begins by studying the relation between education, knowledge and two types of labour markets: the Occupational Labour Market (OLM) and the Internal Labour Market (ILM).

➤ The OLM exists when knowledge and skills are mainly developed outside firms by the education system in accordance with well-established occupational standards. Jobs characteristics are well defined and the education system form students to be able to occupy these jobs. The education system exerts a direct influence of the knowledge base of the firm. The type of qualifications generated by the education system can be "... task-specific, based on standardised, advanced "packaging" of knowledge and skills" (e.g. craft-oriented training or professional education)... or be broad-based general education providing the "meta-competences" that can be adapted and applied across a wide variety of work settings and tasks" (op. cit). The former supposes that the economic environment is rather stable and that job specifications can be codified. The latter corresponds to an uncertain economic environment and the knowledge required is changing accordingly so that individuals can only copy with evolving labour market by relying on their cognitive skills and be able to transfer them to a new context, along the lines described previously. In this kind of market there is high scope for job mobility, and knowledge and learning are embedded in the individuals but provided to different firms thanks to an inter-firm career. "The transparency and transferability of the knowledge acquired is of paramount importance for inter-firm mobility". It can rest on certification (institutional signal) when the economic environment is stable, or peer group and professional networks (informal signal) when the environment is unstable and the

knowledge is therefore less codified and has a larger tacit component that can be revealed only by practice and work performance.

Learning within an OLM tends therefore to be person-centred and market-oriented. It is rooted in the individual's professional and career strategy so that the knowledge base of the firm is enriched by the professional and social network of their existing employees and by the incorporation of new employees. This is related to what is called external or numerical flexibility of labour in the sense that the higher job mobility is, the better the firm is to cope with a shifting market requirements and technological changes. One typical example can be found with the "silicon valley" where firms producing new chips and new software can be benefit with the recruitment of highly qualified engineers with a long experience due to their inter-firm career. This example shows that the OLM can describe the situation of skilled and highly skilled workers, but not the situation of non-skilled and semi-skilled workers for whom external flexibility means precariousness and insecurity and brings little knowledge to the firm.

➤ "Internal labour markets are characterised by long-term stable employment with a single employer and career progression through a series of interconnected jobs within a hierarchy. Knowledge and learning are embedded in an intra-firm career. A large part of the knowledge and work-related skills is generated through firm-specific on-the-job training (OJT). Formal knowledge acquired through education serves only as an entry qualification and provides the basis upon which work-related skills are built within the firm. OJT thus plays a critical role in defining the knowledge base and learning capabilities of firms operating an ILM" (A. Lam, op cit). We can say that Toyota is a good example of an ILM.

A. Lam makes the distinction between two alternative ILM models: narrow jobs and stratified careers vs. broad-based jobs and continuous careers.

"The former is associated with an elitist education system, and the latter, with an egalitarian one. Where jobs are narrowly defined and careers are organized around hierarchies of jobs with tiered boundaries based on formal entry qualifications (e.g. upper-tier work associated with formal knowledge learned through higher education, as in the case of France), OJT will tend to be narrow and job-specific, and the opportunities for career progression based on OJT will be limited. Narrow OJT reduces the variety of the individual's experience and hence limits the scope for creative thinking and the generation of tacit knowledge (I. Nonaka 1994: 21). The containment of learning within a single job prevents the creation of common understanding and knowledge integration. Moreover, the association of formal knowledge with higher positions implies that tacit skills accumulated through practical experience will be under-valued and not recognized as a basis for promotion. The incentives for individuals to accumulate such knowledge are weakened and the organization fails to exploit the potential of 'learning-by-doing'.

An ILM based on narrow job specialization and a career structure characterized by clear tier boundaries generates a fragmented and hierarchical knowledge base.

In contrast, an ILM can also be organized around broadly defined jobs and a continuous career hierarchy based on a common ranking system (e.g. the case of Japan). Progression to upper level positions is achieved, in this case, through accumulation of a wide range of skills and organizational experience. Formal knowledge plays only a limited role in defining competence criteria and entry to senior positions; the key emphasis is on the long-term accumulation of firm-specific skills and practical experience. OJT is broad-based and linked systemically with career progression. Broad-based OJT increases the variety of experience and facilitates the generation of tacit knowledge. Job rotation also serves an important socialization function and helps to reduce social distance between different categories of the workforce. The close integration of OJT with career progression also gives individuals a strong incentive to accumulate knowledge through practical experience. The career hierarchy becomes a device for tacit knowledge creation and learning.

Learning within an ILM tends to be organizational-oriented and self-reinforcing. It evolves along the internal requirement of the firm, and is rooted in a firm-based career and organizational identity. The stability of personnel within an ILM facilitates the retention and accumulation of knowledge". The flaw of this model is that it does not accept learning creating by individual deviance and inhibits the insertion of radical skills that are crucial for creative spirit and radical innovation.

On this basis she distinguishes four contrasting "societal models of knowledge and learning".

"The **professional model** is characterized by a narrow, elitist education based on a high degree of formalization of knowledge. It is rooted in an open labour market based on a high level of occupational codification and specialization. The system is geared to the generation of explicit knowledge and favours an individual approach to learning; the incentives and social structure required for the diffusion and accumulation of tacit knowledge are relatively weak. The professional model gives rise to the dominance of the 'professional bureaucracy' and 'embrained knowledge' within firms. It prevails in countries where the notion of 'professionalism' is deeply rooted in the fabric of societal institutions, such as Britain and the United States. The professional model generates a narrow approach to learning and inhibits innovation". This is the case for instance in large American corporation such as General Motors.

"The **bureaucratic model** shares many common characteristics with the professional model on the formal education and training dimension. However, it is rooted in an internal labour market organized around narrowly defined jobs and a tiered career hierarchy..... The bureaucratic model seeks to control and eliminate tacit knowledge. It generates a superficial approach to learning and has little capacity to innovate. It would be encountered typically in French companies.

"The **occupational community model** is rooted in a region-based OLM surrounding a cluster of interdependent occupations and firms. It is characterized by a high rate of inter-firm mobility which fosters the development of social networks and the transmission of knowledge. It provides an institutional

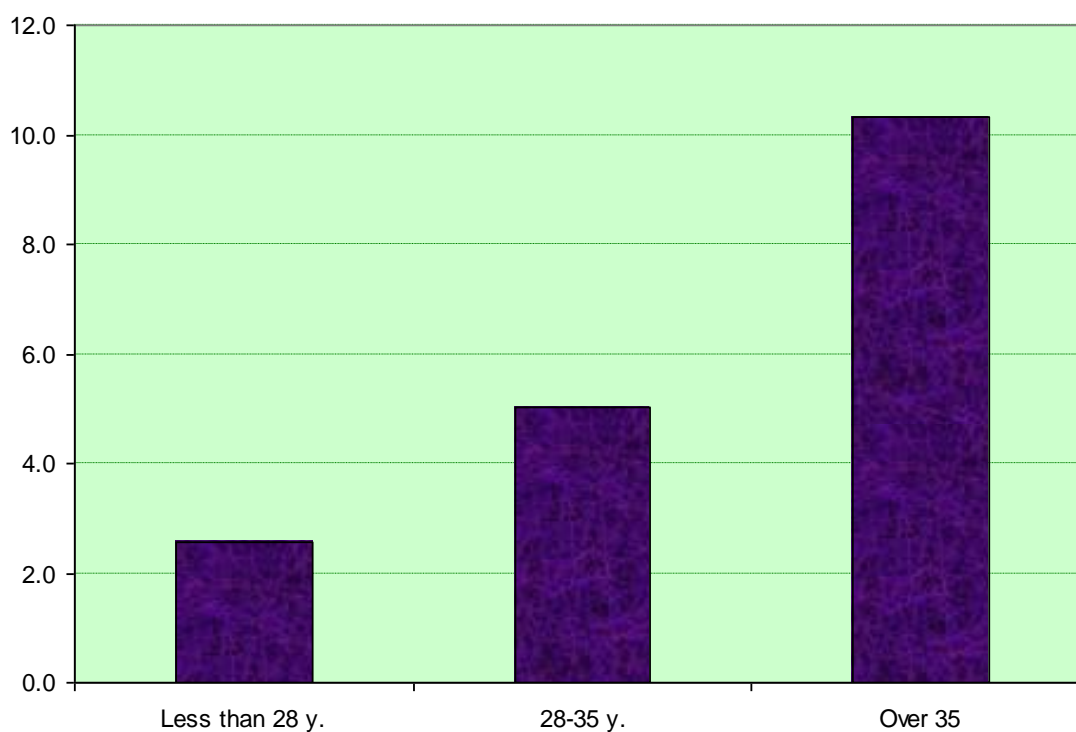
framework and social infrastructure for tacit learning to emerge... An archetypical example is Silicon Valley where a fluid, occupational labour market is embedded in a rich fabric of regional and professional networks...The shared industry-specific values within the regional community ensure that tacit knowledge will not be wasted when one changes employers, and thus gives the individual a positive incentive to engage in tacit 'know-how' learning”.

“The **organisational community model** is characterized by a broad-based education system and an ILM based on broadly defined jobs and a continuous career hierarchy. It favours the J-form organization typically found in Japan. The organizational community model generates a decentralized and cooperative approach to problem solving. It facilitates the transmission and accumulation of tacit knowledge through collective learning within a stable career hierarchy. It has a unique capability to generate innovation continuously and incrementally. Learning within the organizational community, however, is bounded within the firm-based ILM. This generates conservatism and inhibits radical innovation”.

In summary only the “occupational community model” and the “organizational community model” are favourable to the harnessing of tacit knowledge.

Of course, these models are only archetypes and don't represent the concrete situation of countries nor country averages, because it is possible to encounter several models inside one country. But they can be useful to think about the situation of a particular country. In the case of Thailand, we can try to sketch some societal characteristics. The first is that internal labour markets are rare. The mobility of Thai workers is rather high as we can see in figure 2 that present the average duration of Thai workers in the industrial sector (source CELS, 2006). Workers aged less than 28 years stayed on average 3.1 years in the same company. Those between 28 and 35 years stayed 7.3 years in the same company, while those over 35 years had stayed 12 years on average. On the total, the average job tenure over all ages was 7.3 years. In the metallic and electronic industries, the average tenure for all ages is 6.1 years. If we compare with other countries, (see table 6), we can observe that Thailand has an average tenure inferior to Japan and most European countries and comparable to Argentina and the United States and superior to other Latin American countries. But Thailand is much closer to these Latin American countries than it is to Japan and Europe. There are various factors influencing job tenure among them demographic factors. But it remains that on the whole, job tenure is low in Thailand which is more related to a high external flexibility of labour. If we take into account the fact that the education level is still low, and that there are no national job classification that would fit certification delivered by the education system, we can conclude that Thailand is far from the “professional model” described above or even the “occupational community model”. Job mobility does not lead to the enrichment of the knowledge base of firms because of the poor education level, on average of Thai workers. On the other hand the low job tenure does unable the creation of “organisational community model” on a broad scale, even if they are exceptions. For instance, we have been able to observe

Figure 2. Average duration in each enterprise by age in Thailand.



Source: CELS, NRCT project

Table 6 Average tenure and tenure distribution, selected OECD and Latin American countries, various years

	Average tenure (years)	Workers with < 1 year tenure (%)	Workers with > 10 years tenure (%)
Greece	13.6	9.8	52.1
Japan	12.2	8.3	43.2
Italy	12.2	10.8	49.3
France	11.2	15.3	44.2
EU-14*	10.6	14.8	41.5
Germany	10.6	14.3	41.7
Denmark	8.3	20.9	31.5
United Kingdom	8.2	19.1	32.1
Argentina	6.7	27.5	21.2
United States	6.6	24.5	26.2
Peru	6.3	29.0	20.1
Chile	5.5	34.5	18.8
Brazil	5.3	37.2	16.4
Honduras	3.9	51.4	10.1

*Excludes Austria.

Sources: Data for Europe from 2002 based on Eurostat; US data from 1998 based on national sources; Latin American data from IADB (2004) based on household surveys of the late 1990s and 2000s.

Source; World Employment Report, 2004-2005, ILO 2005.

such a model at Toyota in Thailand. It is a case of pure internal labour market with internal career possibility with the explicit objective of revealing and accumulating tacit knowledge. But Toyota pays wages that are among the highest in Thailand. It has decided to pay the price of an “organisational community model”. This is certainly not the case of the majority of firms in Thailand. Finally we will make the tentative assumption that, like France, Thailand is closer to the “bureaucratic model”. Certifications play an important role in the access to job, in public and in private companies. The prestige attached to the diploma is even much higher than in France. In addition, there are other aspects of the Thai culture that are congruent with the bureaucratic model: the paramount importance given to age and social status that are usually associated, and the respect of the hierarchy it creates. However, this bureaucratic model is based on a narrow education base. These are of course sketchy hypothesis that should be further comforted by social research. But if this is close to reality, these means there are two ways to develop knowledge in Thailand, the two being based on a strong increase of the education level. The first way would be to go toward the “professional model” due to the present high job mobility. This job mobility could play a positive role if workers had a much higher education level. This other way is to get closer to the “organisational community model”. But this means increasing job tenure (reducing job mobility) by the development and generalisation of internal labour market. In both cases, a profound social and economical change is needed to achieve these goals.

Conclusion.

The conclusion will be brief because the paper is very long. We don't believe that the advent of an “international cognitive division of labour” will lead to a marginalisation of developing countries like Thailand, provided that a commitment is made to create a national innovation system that could rely on a reformed education system promoting quality and creative (critical) thinking. This is the key to the upgrading of the existing economic activities and the creation of new ones. This should be articulated to the transformation of labour markets.

References.

- Amable B. (2003). *"The Diversity of Capitalism"*. Oxford University Press, Oxford.
- Argyris C., Schön D.A. (1978). *"Organizational Learning: a Theory of action perspective"*. Addison-Wesley, Reading, MA.
- Ark Van B., Timmer M. (2003). *"Asia's Productivity Performance and Potential: The Contribution of Sectors and Structural Change"*. Paper Presented at RIETI-KEIO, "Conference on Japanese Economy: Leading East Asia in the 21st Century?" Tokyo, 30 May 2003.
- Ark Van B., Timmer M. (2000). *"Asia's Productivity Performance and Potential at the Turn of the Century: An international Perspective"*. Working Paper, University of Groningen & Conference Board.
- Arrow K J. (1962). *"The Economic Implications of Learning by Doing"*. The review of Economic Studies, Vol. 29., n° 3, .pp. 155-173.
- Atherton J.S. (2005). *"Legitimate Peripheral Participation"*. Website "Learning". <http://www.learningandteaching.info/learning/situated.htm>
- Booth A. (2003). *"Education and Economic Development in southeast Asia: Myths and Realities"*. In K.S. Jomo Editor: *"Southeast Asian "Paper Tigers? From Miracle to Debacle and Beyond"*. Routledge, London.
- Boyer R. (2004). *"Une théorie du capitalisme est-elle possible?"* Odile Jacob, Paris.
- Boyer R., Freyssenet M. (2002). *"The Productive models. The conditions of Profitability"*. Palgrave MacMillan, New York.
- Brohm, R. (1999). *"Bringing Polanyi onto the theatre stage: A study on Polanyi applied to Knowledge Management"*. Paper presented at the ISMICK conference in Rotterdam, 16 and 17 November 1999.
- Brown J.S., Cook S.D.N. (1999). *"Bringing Epistemologies: The Generative Dance between Organizational Knowledge and Organizational Knowing"*. Organization Science, Vol. 10, N°.4. (July-August), pp 381-400.
- Brown J.S., Duguid P. (2001). *"Knowledge and Organization: A Social-Practice Perspective"*. Organization Science, Vol. 12, N°.2. (March-April), pp 198-213.
- Brown J.S., Duguid P. (1991). *"Organizational Learning and Communities-of-Practice: Toward a Unified View of Working, Learning, and Innovation"*. Organization Science, Vol. 2, N°. 1. (February), pp 40-57.
- Castellaci F. (2005). *"Innovation, Diffusion and Catching up in the Fifth Long Wave"*. Futures, article in press.
- Chandrachai A., Bangorn T., Chockpisansin K. (2004). *« Total Factor Productivity Growth : Survey Report. Part II- National Reports, Thailand »*. APO 2004, Tokyo.
- Commissariat Général au Plan (2002). *« La France dans l'économie du savoir. Pour une dynamique collective »*. Report of the Group presided by Pascal Vignier. La Documentation Française, 286 pages, Paris.
- Coutrot T. (1998). *« L'entreprise néo-libérale, nouvelle utopie capitaliste? »*. Editions la Découverte, Paris.

- Cowan R., Foray D., David P.A. (2000). "*The explicit economics of codification and the diffusion of knowledge*". *Industrial and Corporate change*, Vol. 6, p 595-622.
- Cowan R., Foray D. (1997). « *The economics of codification and the diffusion of knowledge* ». *Industrial and Corporate change*, Vol. 6, p 592-622.
- Dasgupta P., David P.A. (1994). "*Towards a new economics of science*". *Research Policy*, Vol. 23, pp 487-521.
- Dosi G., Freeman C., Nelson R., Silverberg G., Soete L. (1988). « *Technical Change and Economic Theory*. Pinter, London/New York.
- Drucker P. (1993). "*Post-Capitalist Society*". Butterworth-Heinemann, Oxford.
- Duceux N., Jones K. (2006). "*Neo-liberalism in the Schools of Western Europe*". In G. Martel editor, "*Education's Iron Cage. And Its Dimantling In The New Global Order*". OS, Ottawa.
- EU (2000). "*European Report on Quality of School Education: sixteen quality indicators*". European Commission, Brussels, May.
- EU (2001). "*White Paper European Governance*". European Commission, Brussels.
- Felstead, A., Gallie D., Green F. (2004): "*Job Complexity and Task Discretion: Tracking the Direction of Skills at Work in Britain*". In I. Grugulis, C. Warhurst, and E. Keep editors: "*The Skills That Matter*". New York: Palgrave MacMillan, 272.
- Freeman, C. (1982), "*The Economics of Industrial Innovation*". Pinter, London.
- Grugulis, I., Warhurst C., and Keep E. (2004): "*What's Happening To "Skill"?*" In I. Grugulis, C. Warhurst, and E. Keep editors: "*The Skills That Matter*". New York: Palgrave MacMillan, 272.
- Guile D. (2001). "*Education and the economy: rethinking the question of learning for the 'knowledge' era*". *Futures*, Vol. 33, pp 469-482.
- Guile D, Young M. (1999). "*Beyond the institution of apprenticeship: towards a social of learning as the production of knowledge*". In: Ainley P, Rainbird H, editors. *Apprenticeship: towards a new paradigm of learning*. Kogan Page, London.
- Hall R. (2006). "*Knowledge Management Practices in Australian Organisations; Progressive Development or deepening inequality?*" In M. Carton & J.B. Meyer Editors: *Labour and Globalisation* L'Harmattan, Paris France.
- Hirsch-Kreinsen H., Jacobson D., Laestadius S., Smith K., (2003). "*Low-tech Industries and the Knowledge Economy. State of the Art and Research Challenges*". Paper written within the context of the research project "PILOT": *Policy and Innovation in Low-Tech*, funded by the European commission, Framework 5 Programme.
- Hirschman A.O. (1970). "*Exit, Voice, and Loyalty: Responses to Decline in Firms, Organizations, and States*". Harvard University Press,
- Intarakamnerd P., Chairatna P.A., Tangchitpiboon T. (2002). « *National Innovation System in Less Successful Developing Countries: the Case of Thailand* ». *Research Policy*, 31, p 1445-1457.
- Kinghorn, J. and Maasdorp, C. (1999). "*Creating creative know-how: On an agenda for Knowledge Management in the context of an emerging economy*".

Paper presented at the ISMICK conference in Rotterdam, 16 and 17 November 1999.

Khoman S. (2005). « *Education : the Key to Long-term Recovery ?* » In P. Warr editor; « *Thailand beyond the crisis* ». Routledge Curzon, New York.

ILO (2005). "World Employment Report, 2004-2005". ILO, Geneva.

Lam A. (2000). "*Tacit Knowledge, Organizational Learning and Societal Institutions: An Integrated Framework*". Organization Studies, May, 2000.

Johnson B., Lundvall B.A (2001). "Why all this Fuss about Codified and Tacit Knowledge?" DRUID Winter Conference, January 18-20, Aalborg University.

Johnson B., Lundvall B.A (1994). "The Learning Economy". Journal of Industry Studies, Vol.1, N° 2, December, pp 23-42.

Lafer G. (2004). "*What is skill? Training for discipline in the Low-Wage Labour Market*". In C. Warhurst, I. Grugukis, E. Keep Editors. "*The skills that matter*". Palgrave Macmillan, New York.

Lave J., Wenger E. (1991). "*Situated Learning: Legitimate Peripheral Participation*". University of Cambridge Press, Cambridge, 138 pages.

Leibenstein H. (1966). "Allocative efficiency v. "x-efficiency". American Economic Review, Vol. 56 pp.392-415.

Lloyd C., Payne J. (2005). "*The Political economy of skill: A Theoretical Approach to Developing a High Skills Strategy in the UK*." In C. Warhurst, I. Grugukis, E. Keep Editors. "*The skills that matter*". Palgrave Macmillan, New York.

Lundvall B.A (1992). "National Systems of Innovation: towards a Theory of Innovation and Interactive Learning. Pinter, London.

Mouhoub E.M. (2004). "*Mondialisation et localisation des activités d'innovation* ». In "*Croissance et innovation*", Les Cahiers Français, n° 323, La Documentation Française, Paris.

Mouhoub E.M. (2003). « *Division Internationale du travail et économie de la connaissance* ». In C. Vercellone Editor, « *Sommes nous sortis du Capitalisme industriel ?* », Editions La Dispute, Paris.

Mounier A. (2007). « Learning Thailand : Introduction ». Forthcoming.

Nelson, R. (1993). "*National innovation systems: a comparative analysis*". Oxford University Press, Oxford.

Nightingale P., (2003). "*If Nelson and Winter are only half right about tacit knowledge, which half? A Searlean critique of "codification"*". Industrial and Corporate Change, Vol. 12, N° 2, pp 149-183.

Nonaka I. (1994). "*A Dynamic Theory of Organizational Knowledge Creation*". Organization Science, Vol. 5, N°.1. (February), pp 14-37.

OECD. (2000). "*Knowledge-based Industries in Asia*". OECD, Paris.

OECD. (1997). "*National Innovation System*". OECD. (1997). "*National Innovation System*". OECD Publications, Paris.

OECD (1994). "*Science and Technology Policy- review and Outlook*". OECD Publications, Paris

OECD (1986). "*OECD Science and Technology Indicators, (R&D, Innovation and Competitiveness), n° 2*". OECD. (1997). "*National Innovation System*". OECD Publications, Paris.

- Polanyi M. (1966). *"The Tacit Dimension"*. Doubleday, New York.
- Polanyi M. (1958). *"Personal Knowledge: Towards a Post-Critical Philosophy"*. University of Chicago Press, Chicago.
- Reich R. (1992). *"The Work of Nations"*. Vintage Press, New York.
- Ryle G. (1949). *"The Concept Of Mind"*. Hutchinson, London, UK.
- Sfard A. (1998). *"On two Metaphors for Learning and the Dangers of Choosing Just one"*. Educational Researcher, Vol. 27, N° 2, March, pp 4-13.
- Shaiken H. (1984). *"Work Transformed"*. Holt, Rinehart and Winston, New York".
- Smith F. (2004). *"Interactive whole-class teaching in the National Numeracy and Literacy Strategies' Strategy"*. British Educational Research Journal 30 (3).
- Smith M.K. (2003). *"Communities of Practise"*. The Encyclopedia of Informal Education, www.infed.org/biblio/communities_of_practice.htm. Last updated: 21 June 2006.
- Shutz A. (1967). *"The phenomenology of the social world"*. Northwestern University Press, Evanston, IL.
- Taylor F. W. (1911). *"The Principles of Scientific Management"*. <http://www.fordham.edu/halsall/mod/1911taylor.html>
- Timmer M. (2002). *"Climbing the Technology Ladder too Fast ? New Evidence on Comparative Productivity Performance in Asian Manufacturing"*. Journal of the Japanese and International Economies, 16, 50-72.
- Tinakorn P., Sussangkarn C. (1996). *"Productivity Growth in Thailand"*. TDRI, Bangkok.
- Vygostky L. (1962). *"Thought and Language"*. Cambridge, MA, MIT.
- Wilson T.D., (2002). *"the non sense of "knowledge management"*. Information Research, Vol.8, N° 1, October. Available at <http://InformationR.net/ir/8-1/paper144.html>
- Witte J. (2000). *"Education in Thailand after the crisis: a balancing act between globalization and national self-contemplation"*. International Journal of Educational Development, 20, p 223-245.
- World Bank (1999). *"Knowledge for Development"*. World Development Report 1998-1999, Oxford University Press.