The Human Learner – CICS Framework: A Proposal for India’s Development

Roberto Gamarra¹

1. INTRODUCTION
We explore one cognitive international business perspective, Gamarra (2007), that we call the learner perspective. This learner perspective is applied to the problem of export of manufactures in emerging economies.

In a hierarchy of emphasis, when a strong emphasis is placed on the cognitive dimension of individual economic actors, business organizations, and institutions, it can be argued that in most firms in emerging economies, a fundamental problem is the need to learn quickly arising from the cognitive resources and capabilities gap between what they know and can do and what needs to be known and do to become internationally competitive in global exports of manufactures.

The main aspect of the export of manufactures problem we address is the managerial coordination between global exports of manufactures and technological learning in international competitive strategies, in firms from emerging economies. Accordingly, the key question addressed in this paper is: how the interplay between global exports and technological learning strategies works in manufacturing industries? Extensive empirical research was made, to build an understanding of the interface between global exports strategies and the dynamics of global technological learning and innovation. We argue here that the experience of international firms from emerging economies of exporting to technologically sophisticated markets in industrialized economies, was an essential element in shaping the link between exports and technological learning. On the one hand, international firms could not export to industrialized economies markets unless they were knowledgeable enough to master foreign technologies, on the other hand, the experience of interacting with sophisticated costumers, firms, and institutions in technologically sophisticated markets in industrialized economies, greatly facilitated their technological learning development. Moreover, successful sample firms turned the link between global exports and technological learning in a source of competitive advantage in global export of manufactures.

The heart of the work consists of studies of three natural resourced based manufacturing sectors in five Andean economies, and study of leading firms in steel, machine tools, and car manufacturing in Argentina, Brazil, South Korea and China-Taiwan during the period 1960 – 2002. All of our sample firms had started out, in the 1960s, with a relatively low level of technological sophistication, weak knowledge base and learning capabilities, mostly isolated of contacts with sophisticated firms, costumers, and institutions, and faced unsophisticated domestic business environments. After a number of years long technological learning and internationalization cycles, towards the end of the period of study, some of the firms died out (e.g. Turry, Metal Level) and others were surviving (e.g. Acindar, Daewoo Heavy Industries,

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Renault Argentine). On the other hand, several of the firms had achieved world-class sophistication (e.g. Posco, Leadwell, Hyundai Motor Company, Embraer), and were competing on a world market. The successful global learner firms – international firms undertaking global learning seen from a cognitive outlook – had similar strategic intents; they wanted to become global players, and coordinated international technology acquisition, technological learning, and global exports.

Consequently, when a coordination between global exports strategies and technological learning strategies is established, a key insight derived from our emphasis on the cognitive side of international business, is that global exports strategies may be a powerful factor shaping firms’ global technological learning paths, either because they force, trigger, and facilitate the generation of global learning mechanisms, or, because they become the driver of technological learning when international firms are born global or engage heavily in exports to industrialized economies markets. This insight is fundamental to an understanding of how international firms from emerging economies learn to compete in the global knowledge economy, create competitive advantages, and overcome competitive disadvantages.

We consider that the study of the dynamics of the interface between global exports and technological learning is important. A solid understanding of the experiences of international firms, in coordinating global exports and technological learning, can illuminate the work of business leaders facing the increasingly diverse and complex challenges of global strategic management of knowledge, technology, and innovation; and, the work of policy makers dealing with international trade and technological development issues. In particular, we propose the Human Learner – CICS framework as an essential part of a more comprehensive proposal for India’s own variant of Human Learner First development strategy.

The organization of the paper is as follows. In section two we summarize our country, industry, and firm choices and our multi-method empirical research methodology. Based on our empirical findings, in section three we develop a framework for international competitiveness focusing on the cognitive dimension of the interface between human learners, cognitive competence systems (C), innovation systems (I), and competitive systems (CS): the Human Learner – CICS framework. Section four applies the Human Learner – CICS framework to link empirical findings with practical solutions to the managerial coordination between global exports and technological learning. In particular, we propose lessons to be learned by managers, workers, and policy makers from the experience of international firms that succeeded in linking global exports with technological learning strategies.

2. THE EMPIRICAL RESEARCH METHODOLOGY
The analysis of the link between global exports and technological learning is an issue that needs to be addressed in the long-run because technological learning in manufacturing industries is essentially a long term process. That is, the effects of global exports on technological learning, and the effects of technological learning on global exports, can not be studied using econometric techniques covering periods of a few years. Thus, our empirical methodology is inductive and multi-method. Historical comparative case studies allow us to examine long-run effects and evolving relationships among variables. In analyzing the link between global exports and technological learning over a period of four decades, we found that relations between global
exports and technological learning change over historical time; there are changes in the dependent/independent roles of variables, Nell (1998).

We developed historical comparative case studies, at the sector and firm level, as rigorous methods suited to small-sample and integration of quantitative and qualitative data, Gamarra (2004) and Jones and Khana (2006). Our historical comparative case studies at firm and industry levels show that historical variation is at least as good as contemporary cross-sectional variation in illuminating conceptual issues, Jones and Khana (2006).

In this study, we divided emerging economies into Newly Industrializing Economies (NIEs), and Developing Economies (DEs). The NIEs included in the study are two of the largest Latin American economies: Argentine and Brazil; and, two leading East Asian economies: South Korea and China-Taiwan. The DEs included in the study are five Andean economies: Bolivia, Ecuador, Peru, Venezuela, and Colombia.

Three industries in NIEs (steel, machine tool, and cars) were studied. We developed twelve company cases studies that combine quantitative and qualitative data for the period 1960-2002. The firms’ sample includes the largest firms in their respective industries and countries, see table 1. To develop our cases studies, the research strategy was to look at the internationalization processes and technological learning processes of international companies. Then, we analyzed the interplay between those two processes to identify learning by exporting effects, the technological learning mechanisms underlying the learning by exporting effects, and the kinds of causal links between exports and technological learning involved.

One the limitations of the case studies methodology, Yin (2003), we used to develop our comparative company case studies is that it does not allow an accurate measurement of the size of the effects of global exports on technological learning and the size of the effect of technological learning on global exports. Yet, we assigned relevance to our empirical findings and demonstrated why the results are consistent with our central argument, Shaver (2006).

Three industries in the Andean economies were included in the study. Near 70 plants visits were made, during the summer of 2004, to companies in the following industries: canning and preserving of fruits and vegetables (CIIU 3113, Rev.2), processing and canning of fish (CIIU 3114, Rev. 2), iron and steel (CIIU 3710, Rev.2), see table 1. A survey questionnaire covering the period 1990-2002 was implemented during our fieldwork. The survey focused on processes of technological learning and innovation, as well as on the firms’ interactions with institutions in the sector and national innovation systems. Uncertainty regarding exactly what some parts of our data mean, e.g. R&D data, suggested to us that descriptive tables and very simple correlation and regression analyses were the appropriate formats for the sector analysis part of our study.

In all these industries technological learning and innovation are important, and competition is to a considerable degree global.
Table 1: Industry and Firms Sample

<table>
<thead>
<tr>
<th>Sector</th>
<th>Country</th>
<th>Argentine</th>
<th>Brazil</th>
<th>Korea</th>
<th>China-Taiwan</th>
<th>Andean Nations</th>
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</thead>
<tbody>
<tr>
<td>Steel</td>
<td>Acindar</td>
<td>/ Usiminas</td>
<td>Posco</td>
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<td></td>
<td>20 firms</td>
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<tr>
<td></td>
<td>Aluar</td>
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<td></td>
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<tr>
<td>Machine</td>
<td>Turry</td>
<td></td>
<td>DHI</td>
<td></td>
<td></td>
<td>Leadwell</td>
</tr>
<tr>
<td>Tools</td>
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<tr>
<td>Automobiles</td>
<td>RA</td>
<td>GMB / Embraer/Metal Leve</td>
<td>HMC</td>
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<td></td>
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</tr>
<tr>
<td>Canning-</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>18 firms</td>
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<tr>
<td>Fruits</td>
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<tr>
<td>&amp; Vegetables</td>
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<td>19 firms</td>
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<tr>
<td>Canning-</td>
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<tr>
<td>Fish</td>
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Based on our empirical research, the next section develops an organizing conceptual framework – the Human Learner- CICS framework – that underlines the role and importance of the cognitive dimension of individual economic actors, business organizations, institutions, and business environments in the analysis of firms’ international competitiveness.

3. THE ARCHITECTURE OF THE HUMAN LEARNER – CICS FRAMEWORK OF INTERNATIONAL COMPETITIVENESS

Our learner perspective acknowledges the variety of landscapes and mindscapes in the global knowledge economy. Landscapes evoke the structural and fairly objective aspects of international business, for instance the geographical and spatial dimensions of cross-border activities. In contrast, mindscapes bring to mind the subjective and cognitive aspects of such activities. To understand the dynamics of international business, we need not only to comprehend its landscapes and its mindscapes, but also how they shape each other and together evolve into ever more complex international business realities. While we take in account both the tangible and intangible aspects of international business, for the purpose of our study, the emphasis is on the cognitive aspects of international business practices.

The architecture of the Human Learner – CICS framework can be illustrated with the help of the following pyramid:

Graph 1: The Human Learner-CICS Framework

```
Competitive Systems
  ↓
Innovation Systems
  ↓
Cognitive Competence Systems
  ↓
Human Learners in Firms
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Building Blocks
Looking from bottom up, the pyramid emphasizes on the importance of the cognitive dimension of individual economic actors, competence systems, innovation systems, and international competitive systems of business organizations, to understand firms’ performance in international business. There is the need to build a comprehensive framework for global business success, yet, we argue that it should be people – here seen as human learners – centered. Thus, human learners and cognitive competence systems are considered the building blocks of organizational innovation systems driving competitive systems in firms. In turn, the performance of competitive systems shapes the problems and opportunities of human learners’ development. We describe next the four elements of the Human Learner – CICS framework.

**Human Learners in Firms**
The human learner is seen embodied within a system of social and economic interactions in a biologically and culturally designed world. What human learners know and what they do in various contexts is, to a large degree, learned from other human learners.

As economic actors, human learners differ in the way they learn, the information and knowledge/skills they possess, and the way they process, use, and communicate that information and knowledge. All these aspects, among others, make some human learners better learners than others. Thus, we argue that for an understanding of the human learner, it matters what (kind of information and knowledge/skills) is learned, and how (is the process through which) it is learned, storage, mobilized and communicated.

At the core of all technological learning process, innovation system, and competitive system lays human learners’ goals and decisions, mindsets, identities, skills, and efforts. Here, we describe a bold hypothesis that we call the Human Learner First Principle (henceforth HLF Principle).

**Outline of the HLF Principle**
The most general way to state the HLF Principle is as follows:

(A) Nothing surpasses the value of people in the development of a business organization,

(B) The cognitive dimension of people and business organizations are the most important source of innovation and competitive advantage in the global knowledge economy.

This is the human learner first strategic principle of management and leadership in the global knowledge economy. Box 1 presents our view of the historical roots of the HLF Principle. Business organizations have walked through many lives over the last few centuries. They are not who they were in the 1800s and 1900s. In the years 2000s, the fundamental tension between profits and the HLF Principle refers to the tension between the financial demands of an enterprise and the need to develop a management system that recognizes each employee’s whole life as valuable.

<table>
<thead>
<tr>
<th>Box 1: The Historical Roots of the Human Learner First Principle</th>
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<tr>
<td>The historical roots of the notion of Human Learner First are found in Sun Tzu’s <em>The Art of War</em>. Based on Sun Tzu’s book, we consider that the following are the conditions for success in business organizations:</td>
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- Able leadership of people,  
- Able management of people,  
- Strong and high quality of people,  
- Good quality of training of people,  
- Good system of reward and punishment of people.

All these conditions had to be learned by leaders and managers. Also, there is a long tradition of economic and business analyses that put real life people at the center of analytical frameworks. For instance, Francis Bacon (1605) saw nations as learners, and Alfred Marshall argued that “Economics is a study of man’s actions in the ordinary business of life: it inquires how he gets its income and how he uses it. Thus it is on the one side a study of wealth and on the other, a more important side, a part of the study of man.” Marshall (1890, p.1). Eli Ginzberg, in his book The Human Economy treated the economy primarily in terms of the skills and competences of people. Douglas McGregor in his book The Human Side of Enterprise outlined ways in which managers can help employees reach their full productive potential by treating them as responsible, creative, motivated human beings.

This is a management challenge for both employees and employers. As individual human learners, employees bear responsibility for the creation of high performance working standards. Likewise, there is plenty of room for improvement in the way corporations set the tone, pace, and expectations for workers.

Element of the HLF Principle
Analysis of the three terms that compose the HLF Principle results in:

Human: we begin with the acknowledgement of the firm as a social system in which the interplay between human beings takes place. The term ‘human’ represents employees with skills, mindsets, motivations, identities, needs, and interests; not just labor force whose behavior is molded to suit the needs of the corporation and to support its strategies. The HLF Principle addresses one of the greatest aspirations of human kind: to be happy on the job. It argues that the pursuit of happiness on the job is one inalienable right and duty of human learners.

Learner: we begin with the acknowledgement that it is useful to think of business organizations as embodying cognitive systems at multiple levels: individual, units, the whole firm. When an emphasis is placed on the cognitive side of workers and managers, we can see employees as “Homo Discens” or human learners; and the firm as a collective learner. In the context of the global knowledge economy, the mindset of the human learner is to learn as if one were to live forever – long life global learning – and to transform every experience into a learning experience.

First: compare to other types of resources at the firm, human learners are the essential foundation of the business organization. For organizational business success, and for nations’ progress, the first requirement is people, in particular, the quality of the people in the leadership system of the firm.

The Empirical Evidence of the HLF Principle
The HLF Principle was represented in the practice of Fred Gluck at McKinsey & Co. in the 1980s, Bartlett et al. (2004), and Jack Welch, Welch (2002), at General Electrics in the 1990s, both preached that business success “is all about people.”
More recently, based on a sample of 200 global companies, Goldsmith and others:
“...developed a list of the 100 success factors, in order of importance, for leaders past, present, and future. According to those leaders surveyed, the three most important success factors for a leader in the past were: (1) demonstrating self-confidence as a leader; (2) striving to achieve personal excellence in whatever he or she does; and (3) demonstrating honest, ethical behavior in all interactions. Looking at the present day, the picture changes a little bit: (1) demonstrating self-confidence as a leader remains number 1; (2) creating and communicating a clear vision for her or his organization moved from number 8 for past leaders to number 2 for present; (3) consistently treating people with respect and dignity gained importance, moving from seventh to third position. For the future, (1) consistently treating people with respect moved to first position; (2) understanding the impact of globalization on her or his business took a startling lead forward from the 71st (past) positions to number 2; and (3) creating and communicating a clear vision for her or his organization remained in the top three...” Goldsmith et al. (2004, p. 15) [author’s emphasis].
In the year 2004, the government of China put an end to the practice of seeking economic growth at the expense of all else, clearing the way for people-centered governance and development. In a clear response to the question of what the ultimate goal of development is, China’s development strategy established the principle of putting people first, Chai Mi (2004). Box 2 summarizes the putting people first concept.

Box 2: The Putting People First Concept
Chinese Premier Wen Jiabao described the putting people first concept as follows:
- Adherence to the principle of centering on economic development;
- Coordinated development of economy and society;
- Coordinated development between urban and rural areas and the resolution of issues concerning agriculture, the rural areas and farmers;
- Coordinated development among different regions, where in a vast country like China, there remains an imbalance;
- Sustainable development seeking harmony between human beings and nature;
- Adherence to the reform and opening-up drive; and
- Centering all work on the interests of the people in order to meet the demands of the population and achieve an all-around development. The great cause of building socialism with Chinese characteristics must be centered on the people, namely to work for the people and rely on the people.

Relevance of the HLF Principle
People are the key to the cognitive dimension of business organizations and the world economy. While the cognitive dynamics of globalization involves that codified knowledge moves more quickly, this also increases the importance of one of the most localized resources. This resource is people – i.e. their tacit knowledge, their network relationships and their accumulated

We sketch next a proposal of Belly Rationality as a new starting point to build a better understanding of decision making by human learners. Graph 2 presents the concept of belly rationality, in which intuitive thinking and feelings are two aspects interacting to produce gut decision making.

The notion of belly rationality builds on the concept of bounded rationality, Khaneman (2003a; 2003b; 2003c), Nelson (1982; 2002; 2005), the somatic marker hypothesis, Bechara et al. (2005), and insights from ethnology, Nussbaum (2006). The proposed qualification to the understanding of the term ‘rationality’ is multi-fold: not only (bounded) reasoning systems matters, but also the intuitive systems, feeling systems, as well as the cultural systems. Belly rationality means that the core of rational decision making is in the middle of pure emotions and pure logic, that is, intuitive thinking and its background of feelings occupy a position between the automatic operations of perception systems and emotions and the deliberate operations of reasoning systems. Thus, our decisions are often gut decisions.

Graph 2: The Belly Rationality Concept

Thinking System (cognitive psychology angle)

Gut Decisions

Feeling System (cognitive neurobiology angle)

In this study, we attempt to build the Human Learner – CICS framework on a new conceptual foundation, and, propose a more realistic description of the economic actor than the description
offered by the perfect rationality/bounded rationality framework. Emerging evidence from
cognitive neuroscience, cognitive psychology, and ethnology suggests that conventional notions
of a perfectly rational economic actor, or an economic actor possessing a bounded reasoning
system, ignore the important influence of at least three critical factors shaping decision making:

First, the influence of culturally bounded perceptual systems on decision making.
Belly rationality proposes that the human learner has a complex multi-system cognitive structure,
embodying perceptual systems, emotions systems, feeling systems, intuition systems and
reasoning systems.

The perceptual systems of human learners are culturally bounded. For instance, human learners
are culture-bound listeners. Research by Kuhl (2001) shows that, during the first seven months of
life, human learners are global citizens in the sense that they can hear the sounds of any language
spoken in the world. After eleven months, human learners become citizens of a single country,
because they become specialists in listening the sounds of the mother language; e.g., American
babies older than eleven months can not hear the distinction between the ‘shi’ and ‘t-chi’ sounds
in Chinese Mandarin language. Both sounds are heard as ‘she’ in the English language.

Ethnology - a field that deals with ethnic groups’ culture – provides insights to an understanding
of decision making. Different cultural backgrounds favor different intuitions about the meaning
of situations. What is intuitive in a given situation is not the same for everyone belonging to
different groups’ cultures, Nussbaum (2006).

Second, the influence of the interplay between emotions and feelings on decision-making.
Research by Damasio (1994; 2003) and associates has pointed out the importance of the
distinction between emotions and feelings systems in the cognitive structure of human learners.
Emotions are unlearn set of reactions to objects and events that are out in the world or in the
body and mind of the human learner, Damasio (2003). Emotions have a counterpart in feelings.
Feelings are the mental representation or a readout of what is actually happening in the body
during the emotion process. At the level of feelings human learners can decide what kinds of
emotions are good and what kinds of emotions are not good. There is always a backdrop of
emotions and feelings in what we think, thus, human learners are feeling ‘machines’ that think.
The somatic marker hypothesis, Bechara et al. (2005), argues that knowledge and reasoning
alone are usually not sufficient for making advantageous decisions. It provides neurobiological
evidence in support of the notion that people often make decisions based on “gut feelings.” All
the things human learners do in terms of decisions are inevitably accompanied by positive or
negative emotions. Each decision has some kind of similarity with a decision of the past, and
when human learners are in the position to decide once again, they call up an emotional memory
that will appear as a gut feeling and will lead them in one direction or another. So, human
learners have a navigational aid that will help them to get to the right decision.

Third, the influence of the link between intuitive thinking and reasoning on decision making.
A key cognitive distinction in Khaneman’s framework, Khaneman (2003a, 2003b, 2003c), is the
distinction between intuition and reasoning as two ways of thinking and deciding. Reasoning is
what we do when we compute the product of 17 by 258. Intuition is at work when we find
ourselves reluctant to eat a piece of what we know to be chocolate that has been formed in the shape of a cockroach.

The operations of intuitive systems are fast, automatic, effortless, associative, and often emotionally charged, governed by habit, and are therefore difficult to control or modify. The operations of reasoning systems are slower, serial, effortful, deliberately controlled, relatively flexible and potentially rule-governed. The difference in effort provides the most useful indications of whether a given mental process should be assigned to the intuitive or reasoning system.

Studies by Khaneman and associates show that most human learner’s decisions under uncertainty are made intuitively, human learners often make decisions based on gut feelings, and many times their choices do not comply with the rules of perfect rationality, that is, there are cognitive biases – with respect to optimal or perfect rational decision making – in intuitive decision making.

Now, what is the link between feelings and intuition? Feelings are the (cognitive) neurobiological backdrop of intuitive thinking. Intuitive thinking works by selective perceptions of changes in the state of the decision variables in reference, instead of states or levels of the decision variables. In cognitive psychology frameworks, the parameter of reference to measure changes in the decision variables is in the memory representation. In cognitive neurobiology frameworks, in decision making the feeling system works by comparison with feelings in the past. The parameter of reference for decision making is in the emotional memory. Thus, we argue that there is interplay between memory representation and emotional memory. Box 3 presents an illustrative example of the link between feelings and intuition.

Then, we argue that decision-making is a culturally bounded process guided by feelings, intuition, and reasoning. There is a continuous interplay between the feeling and thinking systems in the multi-system cognitive structure of human learners. Thus, there is no a properly working feeling system without a properly working thinking system and vice versa. Considering the large role of the interplay of feeling and intuitive systems in shaping decision making, decisions taken by the human learners are often gut decisions. According to belly rationality, decision making under uncertainty is successful when, given particular circumstances, the human learner develops a harmonious combination of the intuitive, emotional, logic, and cultural aspects of decision making.

<table>
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<tr>
<th>Box 3: EXAMPLE OF THE LINK BETWEEN FEELINGS &amp; INTUITION</th>
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<tr>
<td>People prefer a sure gain of $100 to 50% probability of winning $200 or nothing (i.e., they are risk averse in the face of sure gain). On the other hand, people avoid a sure loss of $100 and take a chance on 50% probability of losing $200 or nothing (i.e., they are risk seekers in the face of sure loss). Cognitive psychology research shows that this behavior contradicts notions of rationality that portray economic actors as perfect rational decision makers. However, the psychological theory of rationality, Khaneman and Tversky (1974, 1981) and Khaneman (2003a), does not show the neurobiological</td>
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mechanisms that help to explain why human learners choose intuitively. Cognitive neurobiology research offers an explanation, Bechara et al. (2005). It shows that information conveying sure outcomes triggers stronger body responses than information conveying less probable outcomes. Thus, a sure gain of $100 triggers a stronger body response than a probable gain of $200, and a sure loss of $100 triggers a stronger body response than a probable loss of $200. This is analogous to the situation in which a person is too hungry and goes to a grocery store. The decision of how much food to buy in order to avoid hunger is altered by the hunger state itself, so that the person is likely to over-estimate the amount of food needed. That is, “risk seeking” and “risk aversion” can be modulated by neurobiological mechanisms underlying emotions and feelings. In situations of uncertainty and ambiguity, logic and conscious deliberation may offer certain choices, but body states, in the form of “gut feelings,” help select the most advantageous response option, select the solution that feels the best.

Human cognition and organizational cognition coevolves, that is, we emphasize the role of cross-individual and cross-generational cumulative learning. The processes of change moulding the aspects of human and organizational cognitive evolution involve mechanisms that select on an extant cognitive variety, and forces that sustain the character of the cognitive resources and capabilities selected, while at the same time there also are mechanisms that introduce new departures to the evolutionary cognitive systems, Nelson and Winter (2002). Cognitive evolution often takes place at several different levels, we consider next the organizational level, e.g., the cognitive processes at a business unit, across different business units belonging to the same firm, across the firms in the industry, and across industries.

Cognitive Competence Systems
Each of the terms of the concept of ‘cognitive competence systems’ can be interpreted in a variety of ways. In what follows, let us elaborate on the specific content they embody in our framework.

Consider first the term cognitive. The concept of distributed cognition in cognitive sciences is one of the most outstanding contributions of cognitive sciences to management science. It means that complex systems created from mixed components such as people, offices, objects, publications, etc. can be identified as the locus of cognition, Girin (1996). In the previous section, we analyzed cognitive systems at the individual learner level. Here, we focus on the organizational level. Cognitive systems at the firm encompass learning of mindsets, identities, information, skills, knowledge, routines, and capabilities at the individual, team, units/subsidiaries, and the whole organization levels.

We begin to conceptualize the idea of the learner firm to emphasize in the cognitive dimension of the international business firm. Over a period of several decades of empirical research on business firms, Chandler (1962; 2001) has evolved a view of the large business firm as an organizational learner. Based on our empirical research, we extend Chandler’s analysis by proposing that it is useful to think of the business firm as a collective of human learners – each human learner with different cognitive frames and interests – with an organizational identity and mindset.
Why are firms organizational learners? Analytically, learning is a dimension of all production activity in two senses. First, all practical aspects of a production activity need to be learned, more broadly, learning occurs in all activities in the value chain (e.g. production, distribution, marketing, and support activities). We propose the notion of cognitive value chain to show that every support and primary activity has a complex cognitive dimension, see graph 3. This cognitive dimension embodies the mutation of information to knowledge/skills, then the mutation of knowledge/skills to routines and capabilities. Each mutation adds new cognitive value to the overall cognitive value possessed by the firm at a point in time. In other words, cognitive value is added when resources (information, knowledge, routines) are used to accumulate capabilities. For example, information on car manufacturing can evolve into knowledge about how to assemble cars, and subsequently, in standard operations to assemble cars, and lastly, in the technological capability to assemble cars.

Graph 3: The Cognitive Value Chain

<table>
<thead>
<tr>
<th>ACTIVITIES</th>
<th>(e.g., Human Resources, Technology Development)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support Activities</td>
<td>(e.g., Inbound Logistics, Operations, Marketing Sales)</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Information</td>
<td>Knowledge/skills</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Routines</td>
<td>Capabilities</td>
</tr>
<tr>
<td>COGNITIVE VALUE</td>
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</tbody>
</table>

Second, to produce goods and services requires knowledge/skills and capabilities, and to accumulate knowledge/skills and capabilities requires learning processes. The firm as a learner is not only a user and repository of knowledge, but also a creator and developer of knowledge/skills and capabilities, and developer of the cognitive ability to create and develop knowledge/skills and capabilities. Firms’ cognitive development – the accumulation of sophisticated cognitive resources and capabilities – can be shaped by the effective management of the corporate learning processes, so it can occur by strategy, rather than by chance or pure trial and error. Thus, it is useful to think of the business firm as a complex cognitive system embodying a system of cognitive competences.

Then, there is the term competence. Competence in this context refers to organizations having a capability to enhance their ability to generate/up grade cognitive resources and capabilities through searching and learning, and to do so in their interactions with other actors in intra-organizational networks and inter-organizational networks.

The building blocks of cognitive competences include, among others, learning to learn skills of employees and the learning to learn capabilities of the entire firm, the capability to learn from practical experience transforming experiences into learning experiences, the capability to learn from other actors’ experiences and best practices, the capability to storage, share, diffuse, and use cognitive resources, and the capability to build organizational learner mindset and identity.

Both, the internal cognitive dynamics of the firm and its learner environments are important
factors shaping the firm’s learning path. For the study of the link between technological learning and global exports, our focus is in the external learner environment rather than in the internal organizational learning environment at the firm.

We elaborated the cognitive diamonds model to show that during the period 1960-2000 industrialized economies, e.g. U.S. and Japan, offered to international firms from emerging economies more sophisticated, or more learner friendly, manufacturing business environments, than emerging economies. Building on the work by Porter (2004), we argued that the hallmark of the notion of competitive Learner Environment (LE) is an emphasis on the cognitive dimension of the business environment.

In the cognitive diamonds model, the LE is understood in terms of four interrelated factors: (i) the technological sophistication of manufacturing firms and clusters, (ii) the extent to which the university system is supportive of technological learning and innovation activities of manufacturing firms and clusters, (iii) the degree of local technological competition in manufacturing industries, and (iv) the sophistication of customers of manufacturing firms in local markets and customer relations management (CRM). Taking together all the four factors, they throw light on nations’ manufacturing LE. The effects of national and industry level public policies, supporting or not manufacturing firms, are assumed to be reflected in the four building blocks of the cognitive diamonds model. The graphical representation of the four factors collectively constitutes the cognitive diamonds, see box 4.

**Box 4: THE COGNITIVE DIAMOND**

Technologically Sophisticated Firms/Clusters  
Technological Competition  
Sophistication of Customer & CRM  
◊  
Supportive University System

Then, technological sophistication of a LE refers to the degree to which the manufacturing sectors of a nation offer a favorable environment for firms’ technological learning and innovation within and at the world technological innovation frontier. The advantages of a sophisticated LE, compared to a LE of much lower level of sophistication, come from facilitating firms’ acquisition/generation of knowledge/skills and capabilities through learning processes, and improvements in innovation and productivity.

Finally, there is the term system. The ‘system’ dimension of the cognitive competence system concept puts attention to interactive ways of learning. These interactive ways include trial and error interactive learning, strategic learning, and inter and intra organizational learning, among others. Consequently, it puts more attention to building linkages with business partners in efforts by firms to strengthening their cognitive capabilities.

One fundamental idea behind the system dimension of cognitive competence systems is that managers cannot easily transplant a ‘high performance cognitive element’ from one system to
another and expect the impact to be identical to what it was in the system of origin. While there is a lot to learn from intelligent comparisons across firms’ cognitive systems (learning-by comparing or benchmarking), it is important to recognize that learning from other firms is difficult because the cognitive practices of other firms are very difficult to pin down in any detail, Nelson (2003; 2005). Different collective learners learn in different ways, and those ways may be very context specific.

**Innovation Systems**
Innovation is multi-dimensional. We focus here on the cognitive aspects of innovation.

Broadly understood, the term innovation refers not only to technological innovations, but any associated changes in business, social systems, and institutions; that is, it refers also to organizational and institutional innovations — ranging from improvements in products or development of new products, improvements in production processes or development of new production processes, distribution and creation of new markets, to improvements in working conditions and business models, and to legal and institutional reforms. For the purpose of our study, we emphasize primarily on technological innovations.

We propose the conceptualization of technological innovation as a *learner’s problem and opportunity*. Innovation as learner’s problem and opportunity means that a series of learning problems need to be solved, and opportunities need to be taken, to obtain successful innovations, that is, innovations that satisfy the needs of customers. The innovation that matters is not necessarily what the innovative firm offer, it is what the customer adopts, Schrage (2006).

In order to do innovations, an international firm must figure out what its problems and opportunities are in its specific industry, and set up revelant technological learning and innovation strategies to solve those problems and tap on those opportunities.

Consider, for instance, R&D. What is the role of R&D in innovation? We view R&D – a set of technological learning processes – not as a source of inventive ideas only but also as a form of problem solving, to be called upon at any time. When problems arise in the firm’s innovation processes – anywhere from operative technological learning of imported technologies to execution of complex innovations to produce new products or processes – a firm draws on its technological information and knowledge base at that particular time, which is made up of its earlier R&D findings and technical and practical experience. The research aspect of R&D takes up the difficulties, which can not be settled with the existing technological information and knowledge base, and R&D employees attend to extend the technological information and knowledge base to be able to solve the new problem.

Firm's innovation capabilities are essentially embodied in human learners. Therefore, human learners, and cognitive competence systems of which they are part, are the cognitive building blocks underlying innovation systems in business organizations.

Regarding human learners, one of the most critical cognitive engines of innovation in firms is human learners’ mindset and skills, that is, employees with a passionate mindset of customer
focus and the skills to satisfy the needs of customers. Through a strong personal relationship with customers and other partners in the global learner network – organizational systems linking through contract and non-contract mechanisms the international firm with customers, competitors, partners, suppliers, science and technology institutions, sales agents, units, and sub-units of the international firm to leverage cognitive synergies – employees get in tune with customers needs. They transmit customer needs back into the company, and help identify the innovation problem and opportunity.

Another vital cognitive engine of innovation is boundariless mindset and behaviors. Innovation is not achieved by one unit/function in a company. To generate innovations, a challenge is to foster collaboration across units/functions through the building of boundariless mindsets among workers and managers. A boundariless mindset and behavior will enable a powerful product flow system from research and early creativity to manufacturing, marketing and sales. Innovation is often lost or compromised if the product flow is slow. So, a vital task for any organization is to create seamless interactions between these units/functions.

Regarding cognitive competence systems, firms aim to foster innovation through the expertise of employees, teams, units, and business partners in its global learner network. Thus, cognitive competence systems play an important role in the building of the specialized knowledge/skills base needed to develop organizational innovation systems. R&D activities are a way to create that specialized knowledge base, they are a sub-set of technological learning processes that underlie innovation, and leads to the creation of new technology in the sense of new production systems and products, Rosenberg (1982), Cantwell (2001), and Allen et al. (2005).

Then, the most important links between cognitive competence systems and innovation are on/off the job training of human learners, R&D activities, and other forms of technological learning. The link between cognitive competence systems and innovation is a two-way link. Business organizations need cognitive resources and capabilities to innovate, and new cognitive resources and capabilities are gained from innovation processes; these two-way relationships make technological learning and knowledge and innovation interdependent. In other words, innovation may be seen as the indirect outcome of technological learning processes that create the technological knowledge needed to produce innovations. On the other hand, innovation may be seen as a process of joint production where one output is innovation and the other is an increase in the competences of the involved workers and managers.

The increases in the competences of workers and managers involve the accumulation, and effective use of, learned information, knowledge/skills, and the subsequent accumulation of organizational routines and innovation capabilities. Now, the creation of innovation capabilities is a subtle matter. Let’s look at the processes of cognitive mutation involved step by step.

First Step, for most companies from emerging economies, innovation as a learner’s problem and opportunity taking begins with the problem of learning to identify, and assess/select, and acquire technologies from advanced economies. Teams of learners in the global learner network of the firm, generate new information and knowledge in an uncertain, effort, time consuming, and costly cognitive process.
Second Step, that new information and knowledge acquired by human learners is the building
blocks of routines – units or chunks of organized activity with a repetitive character. That is, over

time, some of the organizational technological knowledge of the firm matures into routines.
Third Step, institutionalized routines are one of the building blocks of innovation capabilities. A
widely practiced routine at the firm is an institutionalized routine; those routines become ‘rules
of the game’ for members of the firm.
Fourth Step, institutionalized routines and complementary resources (e.g. innovation capability
requires a technology database and equipment) are two building blocks of innovation capabilities.

Notice that information and knowledge are mediated by routines and capabilities in their impact
on innovation and that the use of innovation capabilities generates innovations when the learning
to innovate process is effective. The cognitive processes involved in step one to step four imply
that firms that are effective learners have more and superior information and knowledge, translate that information and knowledge into superior routines or practices, and innovation
capabilities, and use effectively those capabilities to generate innovations. This is not a linear or
smooth process, and there may be many barriers to move from step one to step four.

As an illustration, consider tracing events when a global export strategy is implemented. The
global export strategy of LEADWELL initially generated the acquisition of technological
information and/or knowledge from sophisticated customers, firms, and institutions, with their
own immediate outcomes in expanding the knowledge base of the global exporting firm. These
immediate outcomes, in turn, produced some intermediate outcomes, e.g. new routines and
innovation capabilities; and, subsequently, the intermediate outcomes produced final or ultimate
outcomes, e.g. the generation of new products or processes.

Innovation system analyses enable an understanding of the different kinds of process and product
innovations generated by firms, and, the different kinds of technological knowledge and learning
processes underlying those innovations. A simple way to explain levels of sophistication of
 technological learning processes is to consider the learning of technological knowledge embodied in imported equipment. Learning to operate imported equipment (operative
technological learning) may be less demanding than learning to adapt the equipment to local
circumstances (adaptive technological learning) and learning to improve the original engineering
performance of the equipment (improvement technological learning). Creative technological
learning refers to more sophisticated learning processes, oriented to acquire knowledge about
new processes and products. We describe briefly those kinds of technological learning processes
next.

Operational Learning. To the extent that technology is tacit in nature, the learning of a foreign
technology is not easy and does not end with the purchase of equipment. The firm would be
obliged to devote substantial effort, time, and resources to learn how to manage/operate, maintain, and repair efficiently the foreign technology. Once the equipment and processes have
been put in place, operative technological learning is the basic level of learning a foreign
technology, in which the firm accumulates the knowledge/skills to manage/operate, maintain, and repair imported equipment.

Adaptive Learning. Adaptive technological learning processes generate new knowledge/skills
about initial changes (start-up) necessary to operate the imported equipment, to alter it to reach expected rated capacity and speed, and to adapt equipment to changes in local circumstances.

*Improvement Learning.* The improvement technological learning level of a foreign technology generates new knowledge/skills about how the firm can exploit (beyond the expected rated capacity) the potential capacity of imported equipment. As in the case of adaptive technological learning, the precise content of knowledge/skills generated through improvement technological learning differs widely from one manufacturing technology to another.

*Creative Learning.* Creative technological learning refers to sophisticated technological learning processes, often in the form of planned R&D projects. It is frequently oriented to acquire knowledge about new processes and products.

A simple taxonomy found in studies of technical change is the distinction between radical or major innovations (creation of new products and processes) and minor innovations (adaptations or improvements of products and processes). Like most boundary definitions, the distinction between these types of innovations is not always easy to make. For the purpose of our study, in what follows, we elaborate briefly on: (i) adaptive minor innovations (AMI), and (ii) improvement minor innovations (IMI) of imported technology (here embodied in equipment).

*Adaptive Minor Innovations.* Adaptive technological learning processes may result in new knowledge/skills that strengthen the firm's innovation capabilities to generate adaptive minor innovations of various kinds. Adaptive minor innovations consist of changes in the imported equipment that leaves its core unaffected; they represent incremental alterations given fixed factor proportions. AMI of imported equipment may occur during three momentums: (a) initial adaptations to local conditions, (b) adaptations to reach rated capacity, and (c) sporadic adaptations to changes in the local conditions (e.g. changes in inputs and product markets) during the operational lifetime of the equipment. Moreover, in some cases the supplier of foreign technology may undertake some adaptations due to request from customers.

Included among the enormous variety of AMI in imported equipment in steel, machine tools and cars production are: (i) adaptations to use local raw materials, (ii) adaptations to scale down plant size to avoid wasting the capital investment, (iii) adaptations linked to changes in the product mix to deal with local consumer preferences, (iv) adaptations related to adjustments in the product design to local road conditions, climate, pollution regulations, fuel consumption standards, (v) adaptation to reach expected rated capacity and speed.

*Improvement Minor Innovations.* Improvement technological learning generates knowledge/skills and capabilities that enable the firm to alter (improve) foreign technology through improvement minor innovations. As in the case of AMI, the precise content of IMI differs widely from one industry to another, but it is the essence of these continuous refinements of imported technologies through improvements that only part of them has recognition at the Patent Office, Evenson and Westphal (1995), and Rosenberg and Steinmueller (1988). The motives for IMI may also vary between firms. For instance, in the Argentinean steel producer ACINDAR, institutional factors –delays in obtaining government authorization for conventional capital expansion – triggered capacity stretching minor innovations. The same type of IMI was
undertaken by the Korean steel producer POSCO to exploit potential technical economies of scale, see the cases of POSCO and ACINDAR in chapter four.

There is an enormous variety of IMI in imported equipment in steel, machine tools and cars production. For instance, equipment is improved to reach (i) capacity stretching to more than expected rated capacity and (ii) speed, (iii) for energy saving, (iv) raw material saving, (v) to produce more varieties of products, (vi) better product quality, (vii) better by-product utilization, (viii) lower waste in materials, and (viii) to reduce lost time in the plant.

Our taxonomies of technological learning processes and innovations imply that the firm that seeks to develop specific kinds of innovations must selectively target the specific type of technological learning processes which are best suited to that type of innovations.

The model of global innovation developed by our global learner firms resembles the center-for-global innovation model, Bartlett et al. (2004). Through their global learner network, these companies developed innovations primarily in their headquarters; these innovations were later applied in their subsidiaries overseas. In an era of globalization of cognition and innovation, it has become increasingly important to design and execute effectively technological learning strategies that integrate on/off the job training, R&D learning, and other forms of technological learning. Having explained the cognitive building blocks of innovation, that is, human learners and cognitive competence systems, we turn next to the analysis of innovation capabilities as enablers of international competitive advantage.

**Competitive Systems**

Acquiring international competitiveness is primarily a cognitive process, in which firms learn to compete in international markets. After several years-long technological learning and internationalization cycles, the most successful of our sample companies developed an international competitive system that can be called, *competing through cognition based innovation*.

How international firms – like POSCO, HMC, and EMBRAER – became global players and are challenging now the global leading companies in their respective industries? Our view of the international competitive strategy of leading firms from emerging economies is that these firms evolved over a long period of time a way of competing in international markets that was broadly based on cognition management – in particular management of human learners and cognitive competence systems – as a critical building block of technological innovation competition. This is our basic premise on the generation of competitive advantages – a premise that is based on the empirical findings of our industry and company cases studies.

Consider, for instance, the experience of POSCO. From the early history of the company, the management team developed a strong cognitive orientation to global learning from others and learning by doing, in sustained efforts to catch-up with sophisticated competitors in its global steel industry. The increasingly sophisticated knowledge based accumulated by the company was effectively used to generate minor innovations to become more competitive in cost of production, and, in later years, in the generation of proprietary technologies – the evolution from an imitator to an innovator in the context of the global steel industry. This way the company
evolved a system of competitive advantages in which global learning, knowledge, and innovation played an important role in making POSCO a strong global player in the global steel industry.

To explain the existence of different ways in which the interplay between global exports and technological learning strategies works in manufacturing industries, our framework puts a spotlight on two intertwined variables. One is the corporate strategy. The other is the competitive learner environments in which the international firm operates. Together they form the Strategy – Learner Environment system, see box 5 below, which is a critical component of the competitive system of the international firm. We briefly explain next each one of our two key explanatory variables.

A corporate strategy addresses how the firm intends to deal with its competitive learner environments. Here, expanding the work by Hambrick and Fredrickson (2001), we develop the corporate strategy hexagon, see box 5. It considers six cognitive and choice domains in the corporate strategy design process: goals, arenas, vehicles, differentiation, staging, and economic logic.

The six elements of the corporate strategy hexagon provide answers to six questions:
Goals: what problems in the strategic learner environment of the firm the management team want to solve and what opportunities to take.
Arenas: where will the company be active and with how much emphasis, e.g. which product categories, which market segments, which geographic areas, which core technologies.
Vehicles: how will the company get there, e.g. exports, internal development, joint ventures, licensing, franchising, acquisition.
Differentiators: how will the company win in the market place, e.g. image, customization, price, styling, product reliability.
Staging: what will be the company’s speed and sequence of moves, e.g. speed of expansion, sequence of expansion.
Economic logic: how will the company obtain its returns, e.g. lowest cost, premium prices.

The corporate strategy hexagon distinguishes three levels of strategy design: (i) corporate, (ii) functional, and (iii) cross-functional. After corporate strategy is designed, functional and cross-functional strategies can be designed as supportive strategies. Strategy comprehensiveness is here understood as the consistency between corporate, functional, and cross-functional strategies. Effective cross-functional strategies reveal that managers really have an integrated conception of their businesses.

Two types of strategic fits are considered in our framework. In the internal strategic fit coordination of functions is important because each function affect one another, there are complementarities between functions. First order fit is simple consistency between each function and the corporate strategy. Second order fit occurs when activities are reinforcing. Third order fit involves optimization of coordination efforts, Porter (1996). In the external strategic fit firms need to develop fit between their strategies and changing hierarchies of environments affecting their operations. In the terminology of this framework, this is called the external strategic fit with the competitive learner environments.
Regarding the business environment, as seen above, the cognitive diamonds model of the international business environment identified four elements that make up the competitive learner environment: (i) technologically sophisticated firms/clusters, (ii) technological competition, (iii) sophistication of customers and costumer relationship management, and (iv) supportive university system. How the global learner firm combines opportunities and constraints found in the diverse learner environments in which it operates? Let us consider the experience of EMBRAER as an illustrative example. We consider that the strong global linkages to its sophisticated suppliers and sophisticated client base help to explain EMBRAER’s international competitiveness. In other words, firms with home base in mostly unsophisticated competitive learner environment, as in the case of EMBRAER, would draw knowledge from sophisticated learner environments – successfully engaging in using their commercial partners’ cognitive diamonds – through the development of global learner networks.

EMBRAER has aggressively moved in the direction of using the learner environments of several of its key international suppliers. For example, EMBRAER has moved from key supplier relationships to key risk partnership with several of its main suppliers. Its risk partnerships have as goals to reduce the risk of new product development, to drastically increase their penetration in the partners’ home markets, and to acquire technological knowledge. In its EMB-145 project EMBRAER had only 4 external venture partners that were responsible for the development and production of key parts and modules; more recently, on its newer EMB-170 project, more than a dozen risk partnerships have been responsible for a significant portion of the aircraft.

From the customer’s perspective, EMBRAER’s customer information system and its ‘Aerochain’ portal, are evidence of its focus on global linkages. Aerochain is basically a collaborative e-commerce portal that essentially organizes the aircraft parts and maintenance market around EMBRAER (sitting at its core), connecting more than 550 global suppliers and 170 of EMBRAER’s clients all over the world. By innovating in its costumer interactions, EMBRAER has used global linkages to reduce the productivity disadvantage that firms from emerging economies possess by facing unsophisticated learner environments at home. The establishment of EMBRAER’s global learner network demonstrates the advantages gained by companies able to leverage the knowledge base and innovation capabilities of learners in their enterprise relations network, see Box 5.

Now, exposure of firms to sophisticated learner environments is insufficient, unless they make systematic efforts to internalize and use the knowledge offered. Hence, considerable time and effort must be directed to learn the codified and uncodified knowledge available in sophisticate learner environments. The intensity of effort is more important than the cognitive resources base of the firm, as the former creates the latter, but not vice versa. In other words, taking advantage of the opportunities that are offered by sophisticated learner environments, and overcoming the constraints presented by home unsophisticated learner environments, is far from automatic, it demands effective business strategies.

<table>
<thead>
<tr>
<th>Box 5: The Strategy – LE System</th>
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<tbody>
<tr>
<td><strong>Sophisticated Learner Environment</strong></td>
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</tbody>
</table>
Environment
Technologically Sophisticated Firms/Clusters: 4
Technological Sophisticated Firms/Clusters: 1
   Technological Competition: 5
   Technological Competition: 0
   Sophistication of Customer & CRM: 5
   Sophistication of Customer & CRM: 1
   Supportive University System: NA
University System: 4

Six Elements of Corporate Strategy
Supportive

Strategies
1. Goals
2. Arenas • Functional
3. Staging • Cross-functional
4. Vehicles
5. Differentiators
6. Economic Logic

The diagram shows how EMBRAER faced, during most of our focus period, a mostly unsophisticated learner environment and how through a number of strategies the company acquired codified and uncoded technological knowledge from companies in EMBRAER’S global learner network. The feedbacks from unsophisticated learner environments to sophisticated learner environments maybe increasingly significant, yet, for the purpose of our analysis, we chose to ignore them.
Sources: EMBRAER’s cognitive diamonds values are likert scale from 0 to 5. Adapted from data provided in exhibit 2 and exhibit 3 in Caldas and Avrichir (2005).

Thus, human learners and cognitive competence systems are considered the building blocks of organizational innovation systems driving competitive systems in firms. In turn, the performance of competitive systems shapes the problems and opportunities of human learners’ development, for instance, more and more stable jobs.

4. LESSONS FOR INTERNATIONAL BUSINESS STRATEGY AND PUBLIC POLICY
We use here the framework developed in the previous section to distill our empirical research findings into practical solutions, useful to international business practitioners – managers, leaders, and workers – and policy makers. We present first our managerial and leadership lessons, then we present lessons for workers, and finally, we present lessons for governments from emerging economies.

Lessons for Managers and Leaders
We present our managerial and leadership lessons following the structure of the Human Learner – CICS framework.
On Human Learner Development

One central lesson of this study is that firms have to commit themselves to the continuous development of its members as human learners. This implies building a highly stimulating organizational learner environment and, more importantly, building a strong belief that human learner development has to be a central – not a peripheral – firm activity. These human learner development activities need to be ongoing and institutionalized, and they have to be the responsibility of everyone, in particular of those in the corporate leadership system. Thus, the key is to have people in the leadership system interested in supporting human learner development.

Human learner-based strategies are at the core of our successful global learner firms’ corporate strategies. These international firms placed human learners squarely at the center of their international business activities. Without disregarding other levels of organizational learning, individuals in a network of relations are the primary learners at these international firms. EMBRAER’s focus on the human learner as core entity of the entire development process of the company, HMC’s view that a company bet its future in its human learners, USIMINAS’ strategic choice to make human learners a source of the company’s competitive advantage, and POSCO’s view of human learners as assets to be nurtured and developed, illustrate the important role that human learners play in making our global learner firms faster and better learners.

On Cognitive Competence System Development

As predicted by the belly rationality concept, the perception of managers on the importance of cognitive resources and capabilities differed across managers of sample firms belonging to different cultures. Yet, managers of successful global learner firms recognized the importance of the cognitive development of their firms by investing in cognitive resources and capabilities.

We consider next managerial lessons on learner identity and mindset, organizational cognitive horizon, cognitive integration, benefits of the strategic management of the cognitive dimension of international activities, and cognitive investments.

Learner Identity and Learner Mindset

Learning from the rich learning experiences of POSCO and HMC may help to overcome the lack of learner identity awareness in many international business firms’ cultures. For instance, in HMC, ambitious technological learning strategies involved employee’s devotion to learning, making building a learner identity and mindset part of the organizational learning process. The employees’ devotion to learning was illustrated by learner teams that kept daily records of the knowledge they acquired, and another learner team that tried 30 times to manufacture an engine. Both examples signal learner identity awareness and mindset in at least some HMC’s employees.

Cognitive Horizon

International firms aspiring to go global, or become a strong global player, should undertake proactive behavior in the preparedness to take risks in building global cross-border relations with technologically sophisticated firms and institutions. How big is global learner firms’ cognitive horizon? Compare, for instance, a small or medium size manufacturing company in the Andean economies with a similar size company in the Taiwanese economy. The Andean international
firms’ cognitive horizon is mostly within the South American regional horizon. Taiwanese firms normally work with a broader cognitive horizon, interacting intensively with firms from industrialized economies.

Cognitive Integration
The increasing importance of global technological learning is illustrated by USIMINAS. The share of global technological learning mechanisms, in total technological learning mechanisms, increased from 19% in the 1960s to 30% in the 1990s. Thus, the strategic challenge of global technological learning involves business tactics regarding which business knowledge to acquire from overseas, from local learner environment, and which to develop within the international firm, and how to combine them within a high performance global learner firm.

Emotional integration is an important aspect of cognitive integration. Emotional alignment among human learners, and between them and the firm, can be built through the creation of a common organizational learner identity and purpose, which in turn help to create mutual trust and fluid and flexible collective action. This was illustrated by HMC team learning car style design in Italy.

The Benefits of Strategic Management of the Cognitive Dimension of International Activities.
To profit from the cognitive dimension of international operations, global learner firms:
• Built an understanding of imports of foreign technologies and exports of their products as multi-dimensional processes, involving a cognitive dimension.
• Built an understanding of the backward (international technology acquisition) and forward (learning by exporting) linkages of technological learning processes.
• Integrated the (i) technological learning enabling role of global exports, and the (ii) global exports enabling role of technological learning.

Regarding exports, global learner firms approached the cognitive dimension of global exports in a variety of ways:
• Emphasizing the role of global exports in keeping the company in touch with the latest market developments and comparing the company’s products with foreign products.
• Looking at global exports as a way to become a global learner by actively participating in sophisticated learner environments – in which they can learn from international sophisticated buyers, competitors, suppliers, partners, science and technology institutions – by building a global learner network.
• Looking at global exports as a way to expand the cognitive horizon of the company.
• Using global exports as a way to determine where to undertake training and establish global training partnerships with companies located in the company’s exports markets.
• Using exports to international joint-ventures partners as a mechanisms to source – local market, institutional, and technological – knowledge, and as an outlet to sales of technological knowledge.
• Focusing on knowledge interrelationships derived from purchase and sale transactions, and technology agreements.

Emulation of these strategies is not easy, because, the challenge is not to imitate one single
strategy, but a set of complementary strategies; in our study, the complementarity between international technology acquisition, exports, and technological learning strategies.

**Cognitive Investments**
Investing in strategies that strengthen degree of learner identity awareness, build a stronger global learner mindset, broaden the firm’s cognitive horizon, promote cognitive integration including cross-functional cognitive integration, increase the learning capability, strengthen relationships with business partners to build a global learner network or develop a stronger global learner network, strengthen R&D and other technological learning and innovation processes, undertake more and better on/off the job training of human learners, among others, is part of the preparedness to go global and become a strong global player.

**On Innovation Performance**
When complex cognitive resources and capabilities tend to be messy – hard to codify – and sticky – hard to disentangle from its existing context and use somewhere else – the cognitive dimension of the business organization tend to play an important role in competing through cognition-based innovation.

In the global knowledge economy, a major managerial challenge is to produce innovations by tapping on cognitive resources from the world economy, and using those cognitive resources as the raw material to fuel innovation.

For the few international firms from emerging economies that are already close to the global technological frontier, e.g. POSCO, HMC, EMBRAER, and LEADWELL, the main way to improve technology is to innovate creating new processes/products. The probability that global learner firms develop a new product was increased because these firms combined R&D efforts with management techniques that supported also other forms of technological learning.
For most international firms from emerging economies, that are far away from the global technological frontier, technological improvements can be achieved partly through minor innovation, and partly by copying or acquiring the knowledge previously developed in one of the leading companies, through international technology acquisition.

The international experience of our successful global learner firms shows that global exports and global technological learning and innovation can reinforce each other. Global learner firms approached the co-ordination between global exports and technological learning in a variety of ways:

- Global exports induced the formation of global learner network to facilitate the establishment of relationships on a permanent basis with costumers, joint venture partners, suppliers, competitors, sales agents, science and technology institutions, and learn from them.
- A strategic management model was developed, in which the coordination of exports and technological learning was part of a strong commitment to global exports, innovation, and human learner development.
- Strategic coordination of global exports with technological learning was done by using OEM contracts to source technological knowledge.
- Institutionalizing the co-ordination between global exports and technological learning through the establishment of a Production/Sales Control Department.
• Establishment of global training partnerships with firms operating in the company’s exports markets, and using exports to international joint-ventures partners as a mechanism to source technological knowledge.
• Establishment of strategic management of sophisticated customers’ feedbacks.

*On International Competitiveness*
We present in what follows the most important managerial lessons on international competitiveness.

**The Market Entry Selection Criteria**
Managers at our successful sample firms emphasized the importance of understanding the cognitive characteristics of international and local markets in evaluating market desirability. Targeting customers in sophisticated learner environments helped to overcome the liability of being located in unsophisticated learner environments as their initial historical positions.

**The Technological Learning Dimension of International Marketing**
Our global learner firms are in the process of reinvention of international marketing. Traditionally, international marketing analysts focus on the cognitive dimension of international marketing by considering only learning to export and learning about international markets. This traditional focus misses the technological learning dimension in international marketing. For example, global exports marketing strategies have become a technological learning engine for the Taiwanese company LEADWELL. Thus, if the global learner firm’s export efforts are characterized by high levels of intra-organizational communication and inter-and intra-functional cooperation with R&D and other technological learning related functions, then, technological learning and exports are likely to be more effective.

**Challenging the Global Leader**
Over the last three decades, a number of companies from emerging economies – POSCO, HMC, EMBRAER among others – have managed to evolve from relatively small national players to major global competitors, challenging the dominance of traditional global leaders in their respective industries.

The actual process adopted to manage such dramatic transformation varies widely from company to company. Yet, these companies have followed a long-term historical evolutionary process to build their competitive positions. They exploited latemover advantages by benchmarking the established global players and then maneuvered around them, often by exploiting niches that the large companies had overlook. On the other side, they overcame the productivity competitive disadvantage – facing unsophisticated learner environment at home – by implementing global export strategies and building global learner networks.

**The Link between Global Exports and Technological Learning as Source of Competitive Advantage**
Managers at our successful sample firms turned the management of the interface between global exports and technological learning strategies into a source of competitive advantage. Global learner firms increasingly attempted to leverage the cognitive resources and capabilities available in their global learner network in order to improve their acquisition of technological knowledge,
and accumulation of innovation capabilities, as an important factor in their competitive system.

**Lessons for Workers**
Three major lessons for workers are derived from our study.

**Industrial Peace for Human Learner and Cognitive Development**
POSCO’s outstanding record of industrial peace has been a contributing factor to human learner and cognitive development at the company. During most of our focus period, through a strategic partnership, POSCO’s management and union workers committed to work together. This partnership allowed continuous improvement in joint decision making and to increase employee participation. Industrial peace is an important element in the creation of a learner friendly environment for effective long-term learning processes and cognitive development.

**The Learner Identity and Learner Mindset**
While there is a consensus among Andean managers about the importance of a technological learner mindset – they agree that workers with a technological learner mindset tend to perform better compare to those without a technological learner mindset – the share of operators with a learner mindset was assessed by managers around 50% in the three industries we studied. Moreover, workers with learner mindset were considered the ones that move faster in the career ladder. So, there is plenty of space for improvements in Andean firms’ technological performance by investing in strategies that strengthen the workers’ learner mindset. On the other side, workers can increase their chances to advance their careers by building a stronger learner mindset.

**The Flexibility in the Skills Set and Customer Focus**
Workers need to build the ability to develop themselves with the rapid changes in the global knowledge economy. It is challenging for workers to acknowledge that the skill sets they possess today are likely to be inadequate five years from now, just due to the normal pace of economic change. The increasing importance of international trade of cognitive resources, and the rapid obsolescence of knowledge and skills, is a challenge that can be faced building a global learner identity and mindset as part of the response.

Empowerment of workers for effective customer focus is a natural consequence of the HLF Principle practice. Workers can help to increase organizational knowledge of customers’ needs and ways to solve customers’ problems.

**Lesson for Governments**
This section presents the main lessons for governments of emerging economies.

**The Problem of Exports of Manufactures in Emerging Economies**
One of the main conclusions of an important study of a number of industrialized and newly industrializing economies stated:

"There are certain matters we are sure about...[one] is that a nation’s trade policies must spur, even compel, national firms to compete on world markets." Nelson (1993, p. 20)

This critical finding, and policy recommendation, is corroborated in our study. Many important
national objectives can only be achieved if business organizations are competitive on the world market. From a learner perspective, for many firms in emerging economies, a fundamental problem is the need to learn quickly arising from the knowledge and capabilities gap between what they know and can do, and what needs to be known and do to become internationally competitive in global exports of manufactures markets.

Many firms from emerging economies just remain regional because they are unable to develop global export strategies, or they are finding it too costly and too difficult to go global in their manufacturing exports activities. One basic policy issue facing policy makers is how best help international companies to extract, from their participation in the global trading system, the cognitive elements that will promote the development of a cognitive resources base, and innovation capabilities to increase their productivity, and be able to compete in industrialized economies markets, where the stimulus for learning are bigger. Export of manufactures in itself is not good enough for obtaining international competitiveness. For instance, a primary focus on exporting intensively to unsophisticated competitive learner environments in developing economies markets is not good due to the small stimulus to learning in those markets.

HMC, POSCO, LEADWELL, EMBRAER, ALUAR did not follow the conventional infant producer model. Instead, they follow the infant global exporter model of international firm. Either they were born global exporters or became global exporters very early in their company’s history.

The Cognitive Developmental Role of Government in Models of Human Learner First Development
Models of Human Learner First Development, e.g. China and Latvia, imply a global learning facilitator role of governments. Policy makers need to design and put in place mechanisms and strategies to perform the role of facilitator of global learning of codified technological information and knowledge. This involves creating a learner friendly environment for human learners, business organizations, and institutions – the supply side of cognitive resources markets – and, creating needs for cognitive resources, e.g., through policies designed to strengthen global exports – the demand side of cognitive resources markets.

Considering recent economic history, starting with Japan a few decades ago and recently with China, with Korea and Taiwan in between, East Asian nations discovered that for technological progress to take place, firms and industries need to target sophisticated buyers’ markets, in particular, the larger ones. This involves, among others, not only a lot of hard work, but also very ambitious goals and global learner mindset. Thus, a class of public policies needed is:
•Policies that promote improvements in the influence universities and technical training institutions have on the psychological make-up of workers, managers, and business leaders, e.g., cultivating values of hard work ethics, ambitious goals, and global learner mindset.
•Policies that promote entrepreneurial leaders training to compete in large sophisticated buyers markets, e.g. plant visits to leading companies in advanced countries. Here, classes of public policies can be grouped in two sub-classes. The first sub-class is oriented to support those firms that are already exporting to large sophisticated buyers markets and need to deepen, and strengthen, their innovation and international marketing capabilities. The second class is oriented to support those firms that need to prepare themselves to start trying to export to large
sophisticated buyers markets.

Facilitating Global Technology Acquisitions and Technological Learning.
From our fieldwork findings, one class of public policies needed in emerging economies is the one oriented to facilitate the acquisition of foreign equipment. Imported equipment is the main channel to acquire foreign technology. It is related to the main method of technological learning, and it is the most important factor motivating workers training. Facilitating the acquisition of equipment faces one of the most important obstacles to innovation, that is, high cost and lack of financing.

Building Institutions Connectivity
Public policy should put in place mechanisms that ensure connectivity of institutions – public/private/foreign science and technology institutions, universities, technical training institutions – to firms exporting manufactures. Our fieldwork showed that a central problem in Andean economies is that 60% of firms are essentially on their own – they had little or no support from institutions in their respective sectoral or national innovation systems – in their innovation activities.

To describe briefly a vision of how institutions connectivity could be built, it is important to point out that the kind of connectivity needed is multi-faceted. That is, institutions in the innovation systems have to learn to work with other local institutions, institutions in industrialized countries, and firms. On the other side, manufacturing firms in emerging economies have to learn how to tap on the resources offered by institutions in the innovation systems.

Then, what mechanisms are needed to ensure supportive institutions connectivity? We argue next that the main mechanism is building problem centered innovation systems with a very clear strategic direction.

Building Problem Centered Sectoral Innovation Systems
Evolving problem centered innovation systems are constructed and structured around an evolving central problem. Here the fundamental problem for problem centered innovation systems is supporting firms and industries that (begin to try and do) export manufactures to sophisticated buyers markets. This involve an emphasis on: (a) learning to cooperate (e.g. processes by which firms and institutions develop a mutual understanding of how to work together), and cooperation based technological learning and innovation, (b) cooperation among institutions and firms, and within firms and institutions, to contribute to the solution of the evolving fundamental problem, (c) some levels of coordination among economic actors in the innovation system, and (d) pluralism, flexibility, and competition.

Thus, effective support to strategies of exports of manufactures to sophisticated buyers large markets is the right strategic direction, for science, technology, and innovation supportive institutional building.

Finally, this paper can only raise the issue of global cross-functional strategies, and map out the route to be followed in order to improve cognition management, innovation, and international
competitiveness in export of manufactures. It is up to business leaders and government officials to read the map and get moving.

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