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Systems theory & supply chain management in the e-business era

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Jay W. Forrester made the first approach to a management problem that explicitly claimed to rely upon systems theory in the late fifties (Forrester, 1989). The inventory "ups and downs" suffered by the General Electric household appliances plants in Kentucky were then explained using a computer model developed in accordance with the principles of systems control theory (Forrester, 1959). The methodology was initially called industrial dynamics (Forrester, 1961), before its general character made it known as system dynamics.

One of the major impacts of Forrester's work was the recognition that only system approaches could provide a deep insight into complex dynamic behaviour, such as the bullwhip effect (Lau et al., *1997). The network configuration of today's supply chains with an ever-increasing number of partners - each following its own strategy and taking actions that do not always fit with the common objectives -, the fuzzy nature of many of their inter-relationships, and the dynamic character of all the variables, impose a system approach if effective supply chain management (SCM) is sought (Simchi-Levi* et al., *2000; Sterman, 2000).*

This paper surveys several issues on SCM that call for a system approach and briefly reviews the background and main ideas currently in use. Additionally, as a model approach for companies and their relationships in the context of the network era, e-business is not the answer, one may have thought when trying to integrate both physical and digital dimensions and to create networks of companies organised in order to serve markets and to benefit from client and customer retaining. Finally, this paper presents some empirical evidence to support the ideas explored.

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Scientific methods based on cartesianism and reductionism, so successful in the physical sciences, encountered their first limitations and drawbacks in biology. The modern concept of system, formulated around 1930 by von Bertalanffy - following previous works by Leduc and Bogdanov (Bertalanffy, 1968) -, extended to all fields of knowledge and became the current scientific paradigm.

Systems theory focus the problems raised by complex entities that are perceived as a whole - i.e., that are more than just the sum of its parts - and exhibit properties that can not be derived from these parts. Among the main features that most systems share, it is important to emphasize (Le Moigne, 1977):

- every system has a structure, which is the set of its parts plus the set of rules defining their interrelationships;
- every system has a teleological character, i.e., is driven towards a set of goals, has a purpose;
- every system interacts with its environment, performing activities that change the system's state in order to approach the established goals. In the course of this evolution and due to the presence of feedback loops, the system's structure, the set of goals, and the environment change continuously. A system that interacts with its environment, influencing it, is said to be an open system.

Two types of complexity are usually present in a system: detail complexity and dynamic complexity. Detail complexity occurs when the system has a large number of components and is related to the difficulty the human brain has in dealing with many variables at the same time. Dynamic complexity has a different character and is a consequence of the system's structure. It is related to the ability that systems have to exhibit emergent behaviour, i.e., dynamic changes in their states that cannot be derived from the parts, but are a property of the whole. They can only be understood if one looks at the system's structure, namely at: (1) the causal loops originated by feedback; (2) the time delays that occur between an action and its effect; and (3) the non-linear character of most relationships.

These properties are the main causes for dynamic complexity: in a linear process, inputs are transformed into outputs and, whenever time effects are present, outputs are separated from inputs by a time interval; past influences the present (Richardson, 1999). In more complex processes, however, the result of an action causes modifications of the pre-existing conditions that determined that action, usually after a time delay. Information about the output is fed back to the system as a new input, leading to a corrective action that changes the output (once again after some delay). A simple cause-effect relationship is then replaced by a causal feedback loop - which introduces a non-linearity.

Time delays, feedback loops, fuzzy variables and dynamic environments are features easily recognised by everyone in today's businesses. They are the root causes for the bullwhip effect and much other counterintuitive behaviour presented by social systems (Forrester, 1971). It is thus not surprising that system approaches are now commonly recommended and used in many situations (Checkland *et al.*, 1999; Gharajedaghi, 1999; Sterman, 2000).

The model is another concept that is important to highlight when one starts looking for ways of developing a system approach. The concept of model is so strongly linked to the concept of system that Le Moigne considers the theory of the general system as the theory of modelling (Le Moigne, 1977).

A model is a simplified representation of a system that is useful for solving a problem. Or, in Sterman words (1991), "the purpose of a simulation model is to mimic the real system so that its behaviour can be studied". In addition, as many authors refer, the model's development is driven by the search of a solution to the problem to be solved (Forrester, 1961; Sterman, 2000).

Developing a model is thus an evolutionary complex social process that helps the group: (1) to explicit their ideas about the problem; (2) to identify the features and variables that are relevant to the problem; (3) to achieve a consensus about the problem's nature and delimitation; (4) to get an insight into the system's structure; and (5) to build a construct accepted as a valid representation of the real system. This modelling process is possible because most of the systems have a hierarchical structure: at a given level, the system properties are dependent on the underlying levels only in a very broad manner. Therefore, the study of the system's behaviour at a given level does not require a detailed representation of the levels below, but only demands the description of the structure and behaviours at the level at stake (Simon, 1981; Simon, 1990).

A model that offers a representation of the system that is useful for solving the problem on focus can be used in simulation, which is an experiment performed on the model. Simulations are extremely useful when ethical, economic, or purely practical considerations prevent experimenting with the real system. Through simulation one can also "compress time" and study what would take years to happen in the real world in just a few minutes or hours. These considerations, valid for every system, are particularly relevant when dealing with social systems, where experimentation poses tough methological issues that cannot be easily overcome.

The general availability of computers and their ability to easily store and process large amounts of information and solve thousands of interrelated equations, offers a cheap and powerful way to develop system models and simulate the system's behaviour in a wide range of different scenarios.

The outcome of a consistent set of simulations can be a forecast, as in the case of econometric models, the evaluation of the impact on the system of different environment conditions or internal decision policies, or the outcome of different strategies. Furthermore, through simulation, some unexpected behaviour can be identified and understood and new policies can be designed to prevent them (Forrester, 1971; Simon, 1981).

This background explains why systems thinking, computer models, and simulation are increasingly used as an aid to solving management problems.

It was in the management of large modern engineering projects - starting with the military projects launched in the first years of the cold war - that the high levels of complexity first made a system approach unavoidable (Hughes, 1998). The trend widened soon to other fields, following the systems thinking movement launched by Russel Ackoff and pursued by many others (Jackson, 1999) until the recent attempts to "manage at the edge of chaos" (Stacey, 1995; Beinhocker, 1997; Brown *et al.*, 1998, and many others). Genetic algorithms, cellular automata, evolutionary game theory, fuzzy-logic, agent-based models, real options, soft systems methodologies and system dynamics are some of the methodologies and tools developed in recent years to deal with complexity and which are applicable in economics and management.

Applications range from executive training, design of robust decision policies, evaluation of strategic options, support to change management processes and the development of the "learning organisation" (Senge, 1990).

THE NEED FOR A SYSTEM APPROACH TO SCM

The acceleration of economy and business activity in recent years has only reinforced the need for system thinking and for system approaches to many of the managers' problems.

This dynamics of the environment is the outcome of a large set of different causes linked together in complex networks, where feedback and non-linear relationships are the rule.

The background to this situation is provided by the fundamental role played by technological evolution. Information and communications technologies are usually mentioned but it cannot be forgotten that very simple and non-sophisticated devices like the standardised container (Krugman, 1997) are often the source of large reductions of lead times and of enormous increases in productivity.

Today, using different technologies anyone can communicate directly with anyone, anywhere, and people and goods can move from one continent to another in a matter of a few hours. Every branch of specialised knowledge is freely available to anyone who has access to the Internet.

Ease and speed of travel of people and transportation of goods, together with the diffusion and the general accessibility of information, offer to businessmen the possibility of targeting world markets and provided the basic conditions for the integration of most large economies. The collapse of the Soviet Union and the East European socialist block provided the political and social conditions for the liberalisation of trade and deregulation of markets and a general movement towards globalisation easily took place. To remain competitive in a global economy, many businesses have to pursue large economies of scale. The economic imperative led to designing new political associations ensuring larger "domestic" markets, such as the European Union, NAFTA, Mercosur or ASEAN.

All this evolution took place at an ever-increasing pace. A century ago, sailing ships made most of the sea trade; forty years ago, propeller airplanes offered travel possibilities at an almost unbearable price; twenty years ago, the telex was the standard technology available for rapid transfer of information between two companies.

Any manager who envisages staying in business has to be flexible and adapt his company to all these changes, and has to do it very fast, in spite of the volatility of exchange rates and oil prices and the crushing pressure of the financial markets.

In order to survive today, no single company can succeed by itself. The days are over when a company like Ford could transform coal and iron into cars in a single plant, as *The Economist* (Anonymous, 2002) recently remarked. Focusing on the core business and outsourcing, everything that someone else can do better and cheaper has become the dominant trend and a rule of the game.

In the current times of the globalisation of economies, markets and knowledge, the firm's boundaries are fuzzy, the extended enterprise appears as the new industrial paradigm, and supply chain management is recognized - if not yet logistics network management (Carvalho, 2001a) - as an important piece of corporate strategy (Gattorna *et al.*, 1996). It is increasingly difficult to make the fundamental strategic "make-or-buy" decision, when economies and businesses compete in a global economy, with competition running parallel with cooperation: two fierce competitors in one market must cooperate in another one if they want to succeed. Buyers and sellers look for long-term alliances and become business partners. Selling and buying on a basis point is replaced by outsourcing and the management of the value system replaces the management of the value chain. As stated in a recent paper, "the ultimate core competency of an organization is 'supply chain design', which I define as choosing what capabilities along the value chain to invest in, and develop internally, and which to allocate for development by suppliers" (Fine, 2000). Managing a business becomes inseparable from the management of the partners' network.

A network is a complex system of entities and relationships, processes and flows and therefore cannot be managed - either at a strategic or at an operational level - without relying upon a system approach.

The reason for this arises, in part, from the large number of partners and other stakeholders - each with its own set of objectives - the huge amounts of data, the multidisciplinary expert knowledge needed and the frequent novelty of the situations that are present in SCM.

However, internal dynamic complexity is usually more relevant: linear processes and simple one-to-one relationships are no longer the rule. Multiple choices, bifurcating paths, conflicting goals, information feedback, variable time delay and other elements that originate non-linearities are part of the daily life of today's supply chain manager. Moreover, since the effects of all these are amplified by the dynamics of the external environment, the complexity of each problem in SCM always tends to rise.

In such a situation only a consistent model and simulation can efficiently help to find a solution.

The portfolio of problems that can be solved with simulation is almost unlimited and only a very brief outline can be presented here.

At an operational level, resource allocation, co-ordination of inventory decisions and transportation decisions, and matching supply and demand are some of the problems in SCM usually covered by textbooks (Christopher, 1992; Gattorna *et al.*, 1996; Simchi-Levi *et al.*, 2000) that are easily perceived as requiring a system approach. Models can provide the basis for answering "what-if" questions through simulation, and for finding robust decision policies and optimal decisions.

Distribution strategies, network configuration, organisation design, supply chain integration, strategic alliances and information systems design are some of the strategic decision-making processes where a powerful set of methodologies and techniques using scenario planning and simulation can offer a valuable contribution.

Recently, a newspaper reported on the application of agent-based modelling to the daily scheduling and distribution planning of Air Liquide US operations (Lloyd, 2002). The problem is NP-complete, which means that no algorithm is known to solve it in a time that varies polynomially with the number "n" of basic variables and it is widely believed that no such algorithm exists. At the current state of knowledge, the best that can be reasonably expected is to find an algorithm that could solve the problem in a time varying exponentially with "n". The computer model is able to suggest a workable solution taking into account that 10,000 sites have to be served from more than 200 sources with 100 tractor units and 300 trailers.

Many other applications are reported in the literature, covering matters like the supply chain dynamics (Swaminathan *et al.*, 1998; Fukunaga *et al.*, 2000; Groothedde, 2000; Anderson *et al.*, 2000), partners' management (Sobrero *et al.*, 2002), performance analysis (Cakravastia *et al.*, 1999), decision policies (Strohhecker, 2000) and the integration of product management with order strategies (Barlas *et al.*, 1996).

Executive training is another area where computer models have a long and successful story with applications to teach SCM dynamics that are widely used.

The dynamics of the supply chain provides the background for the beer distribution game (Sterman, 1989; Senge, 1990) originally developed at the Massachusetts Institute of Technology and in use for more than thirty years to educate managers in systems thinking. Other similar games are available, focusing some specific issues (Anderson *et al.*, 2000). However, it is important to notice that several researchers (Sterman, 1994; Moxnes, 1998) frequently report on the difficulties humans have in dealing with complexity and on the learning problems faced by people starting to think systemically.

Some internet modelling systems are already available for learning (Anupindi *et al.*, 2000; Jacobs, 2000) and, in the future, a distributed modelling environment will be available to managers for the design and dynamic simulation of supply chains, if current research delivers what is expected (Duggan, 2002).

THE E-BUSINESS ANSWER

In this context one may say that SCM requires a systemic approach in order to have service as the objective of the whole logistics system, i.e., a system of processes where the key output is service and the major return is related with fidelity and permanency of clients/consumers. Therefore, nowadays, SC (management) should not be thought as a set of directional and manageable processes, one tier upstream and downstream the company, but essentially as a network of companies and processes that can be modeled and, if possible, managed, all tiers upstream and downstream the company (Carvalho e Dias, 2000).

For this reason, the principles of leanness, agility and responsiveness, representing altogether periodical conjunctions of logistics systems' objectives are central to feed the entire network with the necessary energy to act, react, proact and, consequently, serve. The reality shows that those three principles induce energy, as energy is the way to pursue those same principles. A feedback system may then be observed and what appears to be an equilibrium obtained between time, cost and quality of delivery is nothing more than a consequence, or a specific *momentum* and position of the logistical system. Logistics systems are, therefore, permanently accumulating 'potential energy' because natural trade-offs and decisions upon the above-mentioned variables are effects, and simultaneously causes, that are able to sustain a distinctive value position in logistical terms.

With this in mind, and the energy accumulated by each of the companies and correspondent logistics systems, it is possible to think about the network approach as a sum of all value chains and energies in the various levels and positions, namely when represented and proposed by Porter (1985), upstream to downstream. Furthermore, when adequately reformulated, recreated and even extended by Hines (1993), these value chains have an inverse approach, i.e., from market to all the upstream players, only confirming, from a different perspective, the entire network accumulated energy.

In this environment networks may be represented and expressed as being a composition of three essential elements: (1) the various companies or nodes of the network; (2) the whole set of relations, communications and transactions between companies (or the software of the network), including all the digital and the physical relations (atoms for products or components and bits for information); and (3) the whole set of structural elements, like buildings, warehouses, plants, cables (or the hardware of the network), among others (Carvalho, 2001a).

More specifically, from this perspective, the logistical network is an approach that can be identified with the complete e-business approach, where the complete e-business approach is an (inter-) entrepreneurial model, capable of deconstructing and structuring businesses and groups of companies, chains and networks, and of integrating and increasing communication and digital skills with tangible capabilities, among themselves (Carvalho, 2001a). This state of entrepreneurial development will never occur, strictly speaking, if only centred in information systems. Otherwise, potential equilibrium between atoms and bits is eliminated and information technology becomes the unique business driver while in fact, it is, and has always been, nothing more than an enabler.

Some e-business principles have been suggested, developed and presented for the success and sustainability of future business adventures. Kalakota's (2000) vision about e-business, amongst several others signed by prominent authors, is somehow partial and far from complete e-business, and is just what some logisticians have considered to be technological e-business. Nevertheless, one should intend to explore these e-business ideas and to complete them with some logistic thoughts and approaches, namely to understand what is considered a complete e-business and the consequent systems advances needed, or what is considered the real network and the interest of systems theory to understand and manage it.

Thus, the design and implementation of a new model of business, built on agility, leanness and responsiveness should be able to create a network of alliances that emerge whenever a new type of market answer is necessary and most, or preferably all of a demanding, fickle customer's rising needs can be satisfied. This new model is what is understood to be complete e-business in the present and for the future, belonging the future to this whole network of companies, processes, people, atoms and bits, under this name or under another buzzword name meanwhile given to it.

E-BUSINESS AND COMPLETE E-BUSINESS PRINCIPLES: THE REAL NETWORK

All the above-mentioned arguments are the basis for building a more complete e-business set of principles (complete e-business principles). The new formulation relies on the assumption that no technological movement will answer unsolved problems when mixing atoms with bits, or when both physical and digital answers to the demanding world are needed, benefiting from the advantages offered by systemic approaches. Thus:

Old Principle #1: Technology, in e-business, is stated to be no longer just a support. Instead, it is argued that it has become the centre of the business.

One may state that technology is not the unique driving force behind businesses, also because businesses are far from being only information-based; there is still an important physical component that should not be forgotten.

New Principle #1: The organisation, as well as the strategic thought emerging from it, should be permanently based on the following three pillars: wish (or moral strength), knowledge (or information and information systems, communications and technology) and ability to make things happen (or logistics). The need to manage and balance trade-offs is a consequence from deliberate investments in one or another of these three pillars. The investment may be more or less accentuated in any of the pillars, depending on the existing projects, economic and organisational environment and on the dynamics of change one is trying to set up, but it should never be considered that one of these pillars is the center of the business, because businesses are sustained not only by one, but by three complementary and highly interrelated pillars. Thus, these three pillars are also essential to complete e-business models.

Old Principle #2: The business model applied to e-business cannot be the same as in a conventional business, like Bricks & Mortar; it will have to be something hybrid more like Clicks & Mortar.

Businesses should be more virtual, as virtual approaches are able to sustain agility, leanness and responsiveness. Nevertheless, they have to consider the physical component of the business. Businesses should also be more process-oriented and not so vertically/internally oriented.

New Principle #2: The business model should be lean, responsive and agile. Thus if, and only if, Clicks and Mortar 'representation' is able to sustain process-oriented approaches, within and between companies, then it can be considered to build networks of value chains and complete e-business models.

Old Principle #3: The inability to migrate from the current Bricks & Mortar-type model to a business model designed specially for e-business may mean the failure of a commitment to e-business.

New Principle #3: The inability to structure companies by processes, systems thinking, orientation for output and focus on service may mean the failure of a commitment to a complete e-business model.

Old Principle #4: The design of a new model of business, built on flexibility, should be able to create alliances that emerge whenever a new type of market answer is necessary.

New Principle #4: The design of a new model of business, such as complete e-business, built on agility, leanness and responsiveness, should be able to create alliances that emerge whenever a new type of market answer is necessary and most-or preferably all the demanding, fickle customers' rising needs can be satisfied, having greater customer retention degrees in mind.

Old Principle #5: e-Business has the great advantage of obliging companies to listen to their customers.

New Principle #5: Complete e-business has the great advantage of obliging companies to listen to their clients, internally or externally, and to the clients of their clients as well as the whole way downstream through the various value chains, until final customers, since a complete e-business model has to be output focused and market oriented.

Old Principle #6: Technology, in e-business, should not only be used to create products but also to innovate, entertain and facilitate total experience, from the time the order is received to when it is delivered, and to additional service.

New Principle #6: Technology, people and logistics, as well as systems thinking of the whole organization and the network of value chains in complete e-business models should not only be used to create products, but also to innovate, entertain and facilitate total experience, from the time the order is received up to when it is delivered and to overcome necessities/expectations from the market in order to create additional service.

Old Principle #7: The e-business of the future will tend to be based on business communities (or VAC's - Value Added Communities) to better meet final consumers' needs.

New Principle #7: Complete e-business will tend to be based on business communities, or networks of value chains, to better meet internal, first tiers and subsequent tiers of customers, including final consumers' needs.

Old Principle #8: The main management task will be to align business strategies, processes and applications quickly, efficiently and on the first try.

New Principle #8: The main management task will be to 'align' business strategies, processes, applications, but also people, quickly, efficiently and on the first try, taking into consideration the ideas of empowerment as well as processes managed and 'owned' by human capital.

Old Principle #9: Finally, and among others, on the strength of the original "Take an order, give an accurate promise date, manufacture the right goods, allocate properly, ship efficiently, and do all of this in a cost-efficient manner while maintaining a minimal finished goods inventory. Whatever bells and whistles you add to the basic foundation are wonderful, but if you can't do the simple stuff, there's no way you can support the newer applications or leading-edge technology" (Kalakota, 2000).

New Principle #9: Take an order, give an accurate promise date, manufacture the right goods, allocate properly, ship efficiently, and do all of this in a cost-efficient manner while maintaining a minimal finished goods inventory. Whatever bells and whistles you add to the basic foundation are wonderful, but if you can't do the **hardest stuff and dominate business processes**, there's no way you can support the newer applications, the human capital or the logistical dimensions of the business.

In fact, none of this is really new. These whole principles have been suggested, if not explicitly proposed, both by systems theory and by logistical ideas and developments. Combining systems development with logistical management one should find, principle by principle, that neither e-business principles nor even these apparently new complete e-business principles are actually original.

To sustain the need to add a systemic approach to SCM or network management, and to demystify some e-business principles, one should have to appeal to some empirical evidence that will support the necessary conclusions. Indeed, the only possible way is to emphasize something more integrated and complete than e-business *tout court* that, for the purpose of this paper and other publications (Carvalho, 2001a) has been chosen to figure as complete e-business.

During the period between May and July 2001, a survey was conducted with the associates of ECR Portuguese Forum: 56 companies at that time. These companies were considered the most expressive companies operating in the Portuguese arena in the fast moving consumer goods spectrum and they have played a most important role in the improvement of service/time oriented markets. The companies operated in the following business areas: essentially food, drugstore, para-pharmaceuticals, and hygiene and cleaning (Carvalho, 2001b, c).

Companies have been surveyed at the level of producers, retailers and wholesalers. The international leaders, with the best practices, also have been included as long as they have a measurable expression in the Portuguese territory. From a universe of 56 companies, or the universe that has received the formal questionnaire, the results obtained indicate a sum of 39 valid answers: 17 from producers, 14 from retailers and 8 from wholesalers.

Regarding the universe selected for research, the obtained sample is truly representative of the ECR Portuguese Forum, since companies were considered to meet the criteria imposed, namely turnover representation, geographical coverage and brand identity notoriety. Some major results directly related with this paper subject are condensed in the Table (see p. 100).

CONCLUSION

In comparing e-business propositions with the ideas developed by systems' theory and logistical management approaches, analyzed principle by principle, we have concluded that e-business approaches are more powerful when accompanied by other thoughts and complemented with some more structured theories. Hence, if we want e-business to be useful in the future we have to rename it, or even to give the concept a new identity and new contents, namely using the expression "complete e-business".

Therefore, whilst drawing up the paper we found some quite interesting aspects, some coincidences and/or some duplications, which could be useful to demystify technological e-business and to create the necessary equilibrium between the whole set of forces and drivers within and between corporations.

Knowing systems developments as well as logistical management concepts it is somehow undeniable that e-business advances have shown, till now, neither an outstanding structure nor a great creativity or genuine corpus for being considered a new route in terms of management science.

To complete this approach, and to sustain conclusions with some empirical evidence, we have included a few important results from a survey that illustrates not only the relative value of e-business propositions over time but also the critical aspect of human factors and the importance of logistics knowledge. In this context, one may point out that the majority of respondents foresee that the highest e-business potential should be postponed to the near future, but not to a medium term period (compare answers from 2-5 years with those from 5-10 years). This may suggest that e-business is nothing more than a fancy buzzword often applied to a reality that does not exist, which is highly likely to be substituted for another buzzword, its correspondent ideas and, somehow, an imaginative and merely hypothetical reality related with it.

TABLE

Some major results from the survey for, and with, the ECR Portuguese Forum Companies (Producers, Retailers and Wholesalers)

Positive answers depending on time	Today			2-5 years from now			5-10 years from now			Likert scale results (2-5 years from now)
Type of Company	P	R	W	P	R	W	P	R	W	All Answers
Evaluation of e-business potential	11%	21%	0%	79%	86%	75%	74%	86%	63%	3.84
Evaluation of human capital importance & correspondent needs for e-business approaches	16%	29%	0%	53%	43%	50%	NA	NA	NA	4,00
Evaluation of e-commerce offers (today to 2-5 years)	21%	21%	13%	63%	71%	38%	NA	NA	NA	3,72
Professional information interests related with SCM and network management	79%	79%	38%	89%	93%	38%	100%	100%	50%	3,70

Note 1: P- Producers; R - Retailers and W - Wholesalers; Note 2: Likert Scale Medium points indicated, varying from 1 - minimum to 5 - maximum and applied to answers related with 2-5 years from now; Note 3: Answers in this table do not relate to any specific, exemplified or referenced e-business (if any) model; Note 4: Percentages correspond to positive answers; Note 5: NA - not available.

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Macau pre-1999: Value dimensions of a specific group of Chinese*

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The study of Chinese psychology is still a young and developing discipline. Because of political and ideological reasons, virtually no studies were conducted during the period of the Cultural Revolution in China. However, Yang (1986, p. 107) remarked that studies began to emerge, after 1948, especially in the field of personality, in some overseas Chinese territories, such as Taiwan and Hong Kong. Nevertheless, he pointed that the majority of studies were actually pseudo-ethic, due to the direct application of some Western psychological or personality scales. Discipline who has gradually mature, since the late 80s and the early 90s, as more psychologists begun to examine Chinese psychology as an indigenous subject (Cheung & Leung, 1998). This is clearly witnessed with the publication of a volume of *The Handbook of Chinese Psychology*, edited by Michael Bond (1996) from Hong Kong. Some internationally renowned studies have captured the general cultural dimensions of the Chinese (e.g. *The Chinese Culture Connection*, 1987; Cheung *et al.*, 1996) or some indigenous aspects of Chinese culture, such as face (e.g. Ho, 1976; Hwang, 1987) and filial piety (Ho, 1994; 1996).

As the pseudo-ethic problem is gradually been resolved, an arising area brings more considerations. Very often, traditional Chinese cultural values, or the personality traits identified, are somehow generalized to all Chinese people. However, as Chinese psychology advances and become an increasingly mature discipline, the study of specific groups of Chinese and their comparison are two aspects indeed required. For example, Blowers (1996) has raised the need to specifically state if is being made reference to mainland China, Hong Kong, Taiwan, or other regions, when talking about

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