

The Role of New Information and Communication Technologies in the Internationalization of Firms: A Case Study of *Haier**

기업의 국제화와 신 정보통신기술의 역할: 중국 *Haier* 기업을 사례로

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Abstract : It is now widely recognized that new Information and Communication Technologies (ICTs) have been changing the way by which firms conduct their businesses. Examples are the application of enterprise resources planning (ERP) and business process reengineering (BPR) to increase the efficiency of internal resources management, adoption of Business-to-Business e-commerce (B2B e-com) to integrate supply chain, and invention of new marketing channels such as Business-to-Customer (B2C) e-com. These new ways of conducting businesses are believed to help firms to reduce transaction costs and increase productivity. As a result, new ICTs have played an important role in recent growth of many small firms into multi-functional and multi-product corporations and in their spatial expansion towards internationalization as well. This paper takes *Haier* in China as a case to study the role of new ICTs in the growth of firms and reveal how the new technologies have facilitated the expansion of *Haier* into a transnational corporation (TNC) by examining the internationalization process of the firm in relation to its adoption of new ICTs in the period from 1990 to 2002. The study reveals that the adoption of new ICTs has helped *Haier* to integrate its functional units located in dozens of places across the world, which is essential to the internationalization of a firm, and to link closely together its worldwide suppliers and customers to achieve just-in-time (JIT) production and delivery. As such, the authors of the paper argue that, without the facilitation of new ICTs, *Haier* could not have developed into a TNC in less than ten years.

Key Words : new ICTs, internationalization of firms, *Haier*

요약 : 신 정보통신기술(ICTs)이 기업의 비즈니스 처리방식을 변화시키고 있다는 점은 일반적으로 받아들여지고 있다. 예를 들어, 기업의 내부자원 관리의 효율성을 제고하기 위한 ERP(enterprise resources planning)와 BPR(business process reengineering) 활용, 공급 연줄망을 통합하기 위한 기업-기업간 e-com의 적용, 그리고 기업-고객간 e-com과 같이 새로운 마케팅 통로의 창출 등을 들 수 있다. 기업들은 이러한 새로운 방식의 비즈니스가 기업의 생산성 증대 및 거래비용의 절감 효과를 가져온다고 확신한다. 그 결과, 신 ICTs는 다양한 제품을 생산하는 많은 소규모 기업들의 최근 성장과 국제화를 통한 공간적 확산에 중요한 역할을 하고 있다. 본 연구는 중국 *Haier* 기업을 사례로 기업의 성장과정에 신 ICTs가 끼친 역할을 살펴본 것이다. *Haier* 기업은 1990년부터 2002년 시기에 초국적 기업으로 성장했는데, 그 배경으로 신 ICTs의 채택과 관련하여 기업의 국제화 과정을 연구한 것이다. 연구결과, *Haier* 기업의 신 ICTs의 채택은 세계 여러 지역에 위치한 기능체의 통합에 기여했으며, 이는 기업의 국제화에 필수적인 적기생산과 배달체계를 구축함으로써 세계적으로 광범위한 지역의 공급자와 구매자를 가깝게 연계시키는 결과를 가져왔다. 결론적으로 *Haier* 기업은 신 ICTs를 활용함으로써 10년 이내에 초국적기업으로 성장하게 되었다는 점이다.

주요어 : 신 정보통신기술, 기업의 국제화, *Haier*

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1. Introduction

Internationalization and globalization are the major manifestations of the growth and development of enterprises in recent decades. As Jack Welch (1987), Chairman of General Electric, said: "The winners in these global games will be those who can put together the world's best in design, manufacturing, research, execution, and marketing on the largest scale. Rarely are all of these elements found in one country or on one continent." These trends have been propelled by the rapid development of information and communication technologies (ICTs), which makes the global commercial network more and more accessible and flexible, resulting in the revolutionary reform of enterprise operation and management (Jiang, Zhang & Shao, 2002). Enterprise resources planning (ERP) and business process reengineering (BPR) are regarded as the necessary means for enterprise managerial and operational innovations (Hammer, 1990; Champy, 1993), and they should be accomplished through the adoption of new ICTs within and out of the enterprises. With the spatial expansion and popularization of new ICT infrastructures, more and more enterprises start to develop new ICTs-based tools of operation and management to improve their capacity of responding to quick market change and to adopt just-in-time (JIT). The new tools include business-to-business (B2B) e-commerce, business-to-customer (B2C) e-commerce, etc.

It is argued that the adoption of new ICTs and new management tools will boost the re-organization of enterprises toward spatial decentralization and internationalized value chain fragmentation, and also reinforce the globalization of existing transnational corporations (TNCs). Positive contributions of the adoption of new ICTs to the internationalization and globalization of enterprises have been studied from such aspects of enterprise

operation as R&D, production and marketing (Dunning, 1993; Gourevitch, Bohn & Mckendrick, 2000; Howells & Wood, 1993; Montgomery & Hariharan, 1991; Patel & Pavitt, 1997; Zander, 1998; Dunning & Lundan, 1998). These studies, however, are based on investigations of TNCs and small and medium-sized enterprises (SMEs) in the developed countries, and little has been known about TNCs and SMEs from the developing countries.

With the ongoing reform toward a market economy, more and more enterprises in China have been developing very rapidly and started their internationalization processes. Haier is a typical case of such internationalized enterprises. Established in 1984, Haier is a fast-growing and eye-catching manufacturer of household appliances in China, and in the world as well. In China, Haier has a thirty percent share in the market of refrigerators, air conditioners and washing machines respectively. However, in 1984, Haier was only a small local plant in Qingdao, Shandong Province, making refrigerators with imported technology from Germany. At present, the plant has developed into a TNC with thirteen overseas plants and sixteen overseas R&D or design centers, and with its products exported to more than 160 countries. The successes of Haier in internationalizing its business have attracted increasing attention from scholars of different origins, and diversified factors are found to contribute to its success (Sun, 2002; Gao, 2003; Marlom, 2002; Liu and Li, 2002). While corporate culture and management ideas are key to Haier's success, it is admitted by its top managers that new ICTs have also played an important role in its fast development. The purpose of this paper is to analyze dynamic interactions between the adoption of new ICTs and internationalization of Haier. We hope that our analysis will help to understand the internationalization of enterprises in the developing countries in the era of knowledge economy.

2. Analytical Framework

The evolutionary theory was introduced into the studies of economic dynamics by Nelson and Winter (1982). The concepts such as trajectories, path-dependence, lock-in and accumulative learning are widely employed to describe organizational economic activities within certain periods and milieus. The interactions of factors and the consequences are regarded as the major mechanism for the evolution process of organizations. As for the internationalization of enterprises, recent literature argues that technology innovation and coherence are among the major factors for the internationalization processes of large firms (Patel and Pavitt, 1997; Zander, 1998; Piscitello, 2000). However, not much literature is available in the impacts of the adoption of new ICTs on the internationalization of enterprises. In this paper, we will take the evolutionary approach to analyze the dynamic relationships between new ICTs adoption and business internationalization of Small and Medium-sided Enterprises (SMEs).

Based on the evolutionary theory, we have developed a theoretical framework as shown in Figure 1. In the framework, we would like to make the following arguments and use in-depth analyses of Haier's evolution to prove them.

- (1) The adoption of new ICTs enables enterprises to reorganize businesses through ERP and BPR;

- (2) The establishment of ICT-intensive networks like B2C, B2B, and intranet is regarded as the consequence of enterprise reorganization;
- (3) The ICT-intensive networks not only help to increase the responsiveness and flexibility of enterprises, but also enable and promote their spatial expansion and integration;
- (4) The enterprise functional restructuring and spatial expansion interact with each other;
- (5) Positive outcomes of enterprise restructuring and expansion will reinforce the adoption of new ICTs, which is an important force for enterprises to achieve sustained global development.

3. Trajectory of ICTs Adoption and Internationalization of Haier

Since its establishment in 1984, Haier has registered an average annual increase of sales by seventy-eight percent. At present, Haier produces a wide range of household appliances in eight-six categories and 13,000 specifications. According to a survey by *Euromonitor*, Haier ranks the fifth in market share among all household-appliance providers in the world, after Whirlpool, Electrolux, GE, Bosch-Siemens, and ranks the first in refrigerator market. In China, Haier is regarded as one of the most successful enterprises in both the adoption of new ICTs and

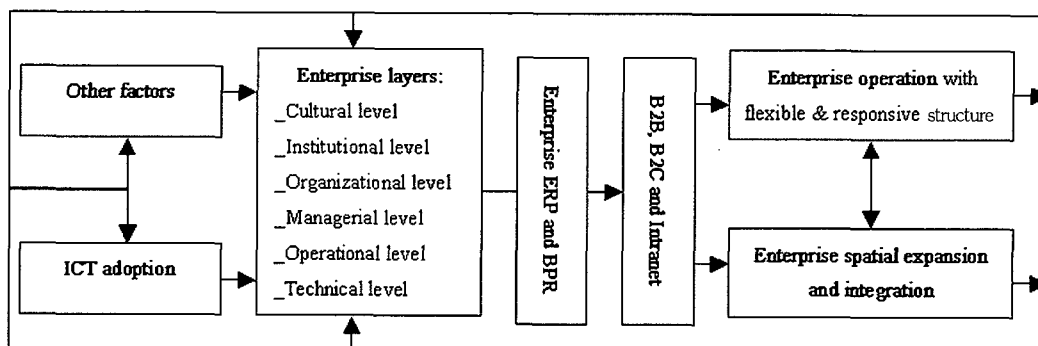


Figure 1. Dynamic interrelations between ICT adoption and internationalization of enterprises

the internationalization of businesses. The trajectory of Haier to adopt new ICTs and internationalize its businesses is listed in Table 1 and more details are provided in the Appendix. Table 1 shows that the development of Haier can be divided into three strategic stages; i.e. the OBM (original brand manufacturing) period (1984-1991), diversified development period (1992-1998), and internationalization period (1999-2002). From stage to stage, the internationalization of Haier has been accompanied by the adoption of new ICTs and continuous re-organization.

4. Current Situations of Haier ICTs Adoption

1) The ICT-intensive Operation Systems under BPR

In 1998, Haier decided to adopt BPR based on ERP to realize its internationalization strategy, which aimed to change the original multi-division systems into market-oriented horizontal units. Under the new business model, the original commodity and international promotion headquarters, the product headquarters and ODM (original design and manufacturing), and the logistics centers of

Haier are restructured into independent units along the intra-enterprise value chains, and these new functional units are simultaneously responsible for the flow of orders derived from global customer resources. Besides, the whole business system links together global suppliers and customers through supply chains of products and flows of capitals. The new system is supported by a 3T security system, i.e. total capital management (TCM), total productive maintenance and management (TPM), total quality management (TQM), and also supported by a 3R development system, i.e. research and development (R&D), human resource development (HR), customer relation development (CR). The foundation of these new business practices is Haier's management philosophy of OEC (overall; everyone, everything, everyday; clean and control) and its corporate culture (See Figure 2).

2) ICT Infrastructure Networks of Haier

Haier established its public websites by connecting to the worldwide website networks in 1996, and began to construct its Intranet in 1998. The core equipment like ATM comes from CISCO, USA. All the networks are centered on the global headquarter of Haier in Qingdao. Functional headquarters, divisions and regional branches, trade companies, industrial parks, call centers, and B2C-based cus-

Table 1. Dynamics of Haier ICT adoption and internationalization (1984-2002)

Period	Strategy	Management	ICTs Adoption	Domestic Expansion	International Expansion
1984-1991	OBM	From TQM to OEC ¹	Traditional ICTs	Localized expansion	Technology and management introduction from Germany and Japan
1992-1998	Diversified development	External take-over	Internal information center Corporate Website	Establishment of domestic factories and R&Ds	Joint design with international partners OEM to USA
1999-2002	Internationalization	Market-chain-guided BPR	New ICTs adoption through BPR and operation via B2B, B2C and intranet	Competitive location all over the country; Establishment of domestic branches as the essential parts of global value chains	Global design networking; Global marketing, purchasing and serving; Globalization in USA and Europe

¹ OEC: overall; every day, everything, every one; clean and control.

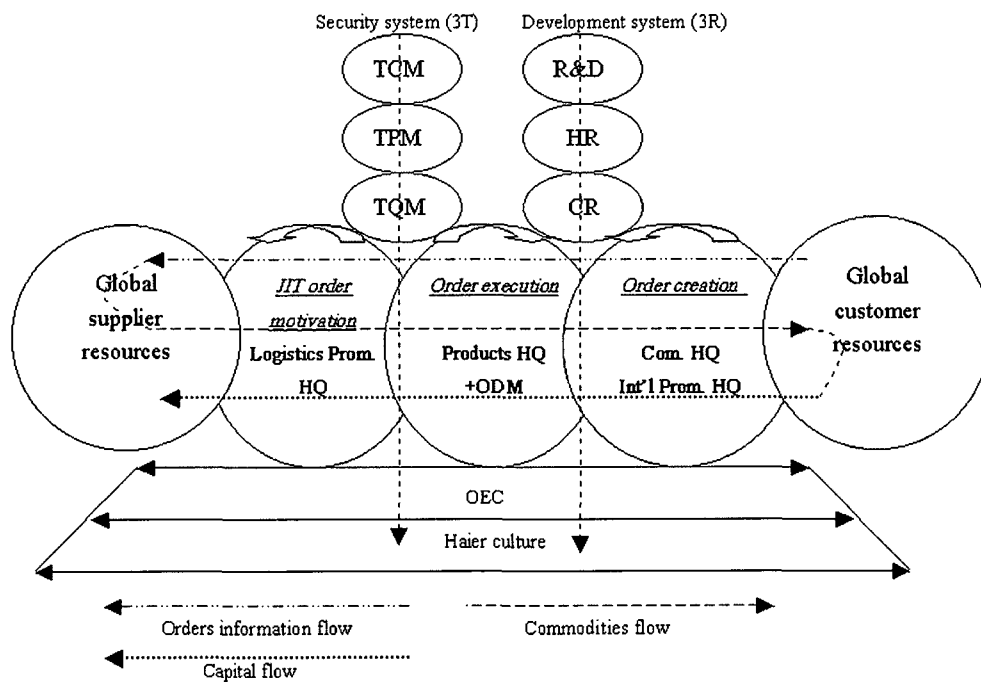


Figure 2. Internationalized operation systems of Haier

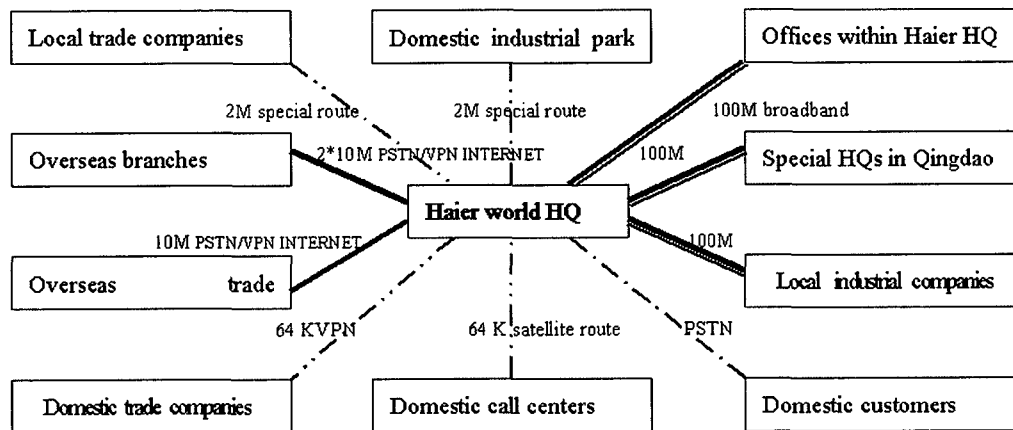


Figure 3. The topological illustration of worldwide ICT networks of Haier

tomers all over the world are closely linked via the Intranet and Internet. Different lines of the networks have different bandwidths as the degrees of inter-connection are diversified (See Figure 3).

3) ICT Networks as E-business System

Haier has established sophisticated ICT networks

based on ERP (See Figure 4). According to their business functions within and outside of the enterprise, at least three categories of ICT networks can be identified; i.e. B2B networks, B2C networks and Intranet networks. The structure and operation procedures of Haier's B2B and B2C have been discussed by Liu (2001). The Intranet is an integrated system of differ-

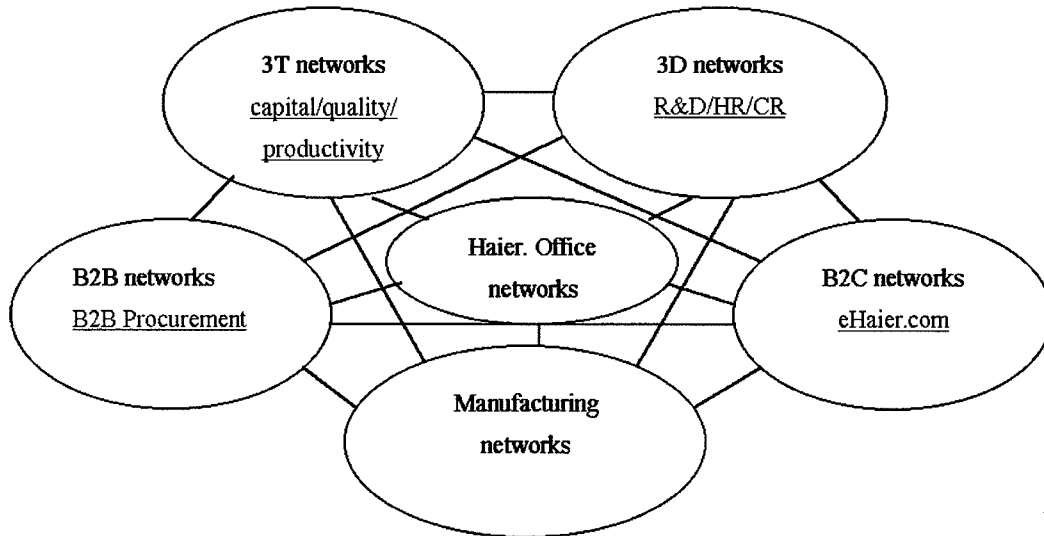


Figure 4. Functional divisions and connections of *Haier* ICT networks

ent functional networks, including manufacturing management networks, 3T networks, 3R networks, and office automation (OA) system (see previous discussion for the meanings of 3T and 3R), which plays the role of enterprise communication, coordination, and control. All the functional networks are connected with each other while converging on the whole system. Different networks are simultaneously responsible for handling the information flow of orders from the worldwide market.

5. Impacts of the Adoption of New ICTs on *Haier's* Internationalization

1) A Brief Introduction to *Haier's* Internationalization

After the two strategic stages of OBM and diversified development in the period from 1984 to 1998, Haier developed its new strategy of internationalization in 1999. By 2002, Haier has established an international business framework with networks of competitive trading, design, production, distribution and after-market services. It now operates eighteen

design institutes, ten industrial complexes (one in South Carolina, USA; one in Pakistan; in China, five in Qingdao, one in Hefei, one in Dalian, and one in Wuhan), fifty factories, fifty-six trade companies, 58,800 sales agents, and 11,976 after-market services centers throughout the world. Overseas businesses have become an essential part of Haier's global strategy (See Figure 5). Meanwhile, Haier's products have entered twelve of the fifteen European top supermarket chains as well as eight of the ten American top ones, using localized design, production, and sales in the United States and some European countries. With the development of its internationalization strategy, Haier has attracted a few TNCs, like Sanyo (Japan) and Emerson (USA), to set up specific component supply branches in Qingdao. On March 4, 2002, Haier officially opened American headquarters in New York, which is located at the landmark neo-classical bank building on Broadway in Manhattan. This new regional headquarter indicates that Haier has moved into a new stage to globalize its product design, manufacturing and sales, with a strong wish of long-term development in the United States.

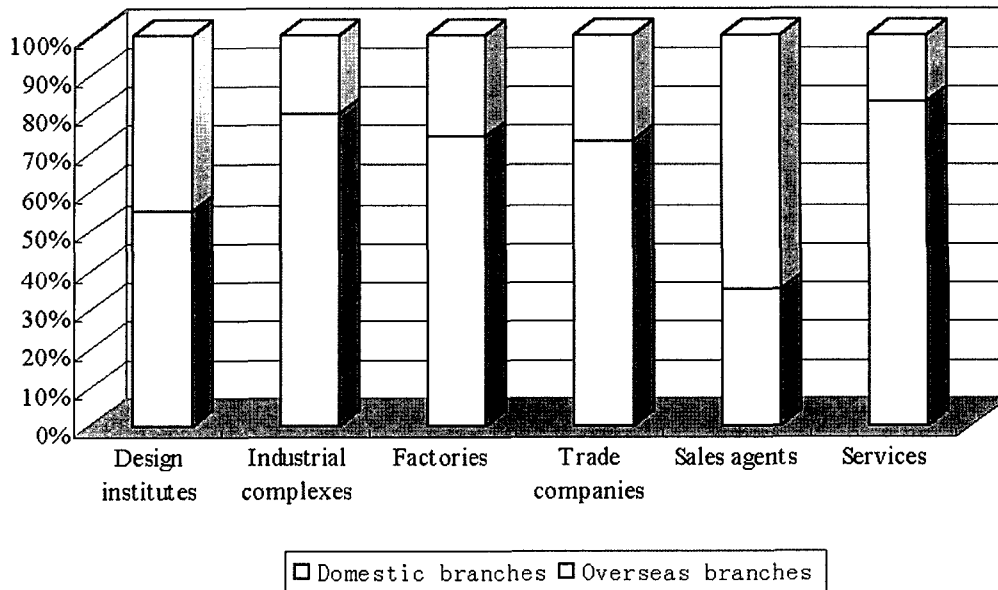


Figure 5. Domestic and overseas business units of Haier, 2002

2) The Adoption of New ICTs in Haier’s International Businesses

The internationalization strategy of Haier was accompanied by BPR, which was initiated in 1998 and aimed to integrate the market chains. The establishment of overseas promotion headquarters is a result of BPR. These newly established headquarters are responsible for deriving overseas orders and ensuring the satisfaction of orders. The adoption of new ICTs is the premise of Haier’s overseas businesses, while the rapid increase of overseas orders makes the adoption of new ICTs necessary. The process of obtaining and satisfying overseas orders based on new ICT tools is illustrated in Figure 6.

3) New ICT Adoption and Internationalization: the case of Haier’s R&D

Cantwell and Santangelo (2000) find some evidences of a convergence in corporate technological diversification across large firms, facilitated by the common use of new ICTs as an integrator of formerly separate technological systems. This has enabled small firms to diversify, and large firms to consoli-

date activities around those technologies that have become extremely interrelated. Much literature is now available on the internationalization of Haier with regard to its global marketing, manufacturing, and even global purchasing (Jiang, Zhang, and Shao, 2002; Sun, 2002; Gao, 2003). The importance of ICT adoption in Haier’s global expansion is also discussed by Marlom (2002). Nonetheless, little is known about the interactions of ICT adoption and global R&D activities of Haier. Going global as an enterprise in a developing country, Haier chose to internationalize its R&D activities instead of obtaining advanced technologies and management methods from the outside world. The technologies introduced from Germany and Japan and the establishment of international standard quality identification systems like ISO 9000 in the early days, laid the foundation for Haier to export its products to the US and European countries. Since 1994, Haier has been making great efforts in developing its worldwide R&D networks, which plays an important role in boosting the internationalization of its businesses. By the late 1990s, Haier had established an immense global R&D network based on new ICTs, including

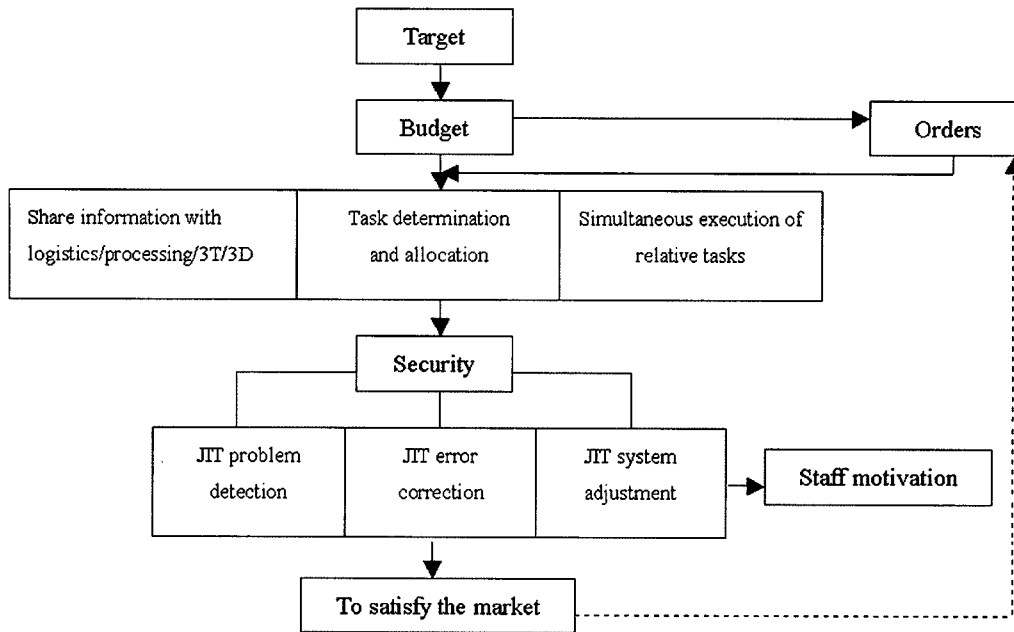


Figure 6. Overseas order obtaining & satisfying processes of Haier supported by new ICTs

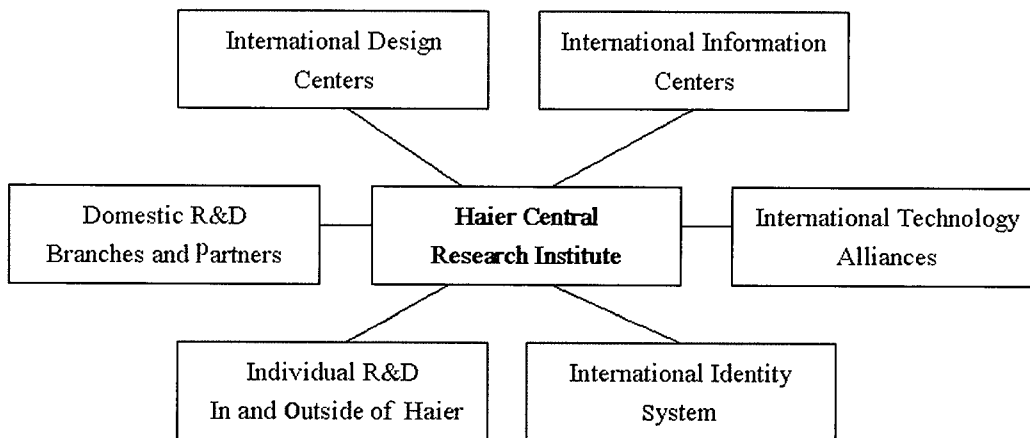


Figure 7. Haier's global R&D system

Haier Central Research Institute (in Qingdao), six international design centers (Los Angeles, Amsterdam, Tokyo, Lyons, Montreal, and Silicon Valley), ten international information centers (Hong Kong, New York, Seoul, Sydney, Los Angeles, Amsterdam, Tokyo, Lyons, Taipei, and Montreal), and dozens of technological alliances with world big

names such as Microsoft, Philips, Martz, Panasonic, and Mitsubishi. To some extent, the global competitiveness of Haier is mainly supported by its exuberant global R&D networks (See Figure 7).

Haier manages to integrate its worldwide design and information centers and other R&D resources via the Intranet and Internet to achieve paralleled

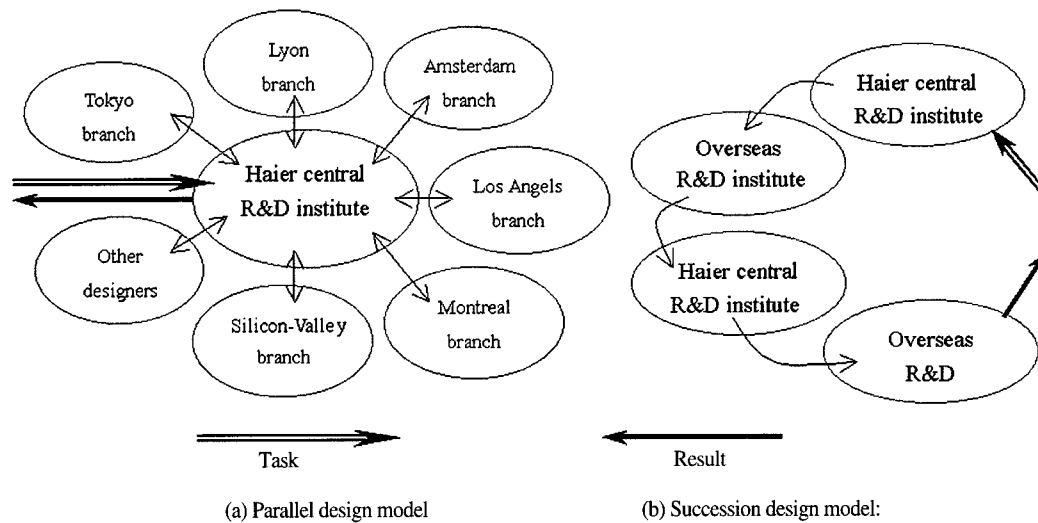


Figure 8. Two time-spatial models of *Haier* global R&D

design (Figure 8a). As an important step of worldwide R&D integration, in 1999, Haier developed the PDM (product database management) software running via special R&D networks for synthesizing CAD, CAE and CAM, and established a C3P center to manage it. PDM consists of four subsystems, i.e. program management, document management, network management, and data retrieving. The system now operates well, as demonstrated by Haier Mould Co. Ltd., and is introduced to other divisions of Haier (Jiang, Zhang and Shao, 2002). Besides the paralleled design activities, Haier has also tried global 24-hour/day successive designs. A case is the 24-hour/day successive design of blue-tooth technology for network household appliances in Haier’s design center in Qingdao and Ericsson’s R&D center in Sweden. Design staffs of Haier in Qingdao do their research at daytime and send the daily results via the Internet to Ericsson staffs before 9:00 PM (Beijing Time) so that the latter can continue research at Beijing nighttime. Ericsson staffs pass back their results at the end of their working day so as to continue research by Haier’s staff in Qingdao. The research program is therefore accelerated and finished in only two months. The global 24-hour/day

successive R&D model is also being successfully adopted in the development of IC technology between Haier’s staffs in Qingdao and Silicon Valley (Figure 8b).

4) Efficiencies and Effects of ICT Adotion

With the adoption of BPR, Haier has developed a global value chain through its networks of R&D, manufacturing, marketing, and after-market services. International businesses have contributed a lot to the growth of Haier and the internationalization process of Haier is so far successful (Table 2). The adoption of new ICTs, which includes both ICT infrastructures (hardware) and management solutions (software) for BPR, contributes very much to the internationalized development of Haier. The efficiencies and effects of Haier’s adoption of new ICTs can be seen from the comparison of enterprise performances before and after BPR (See Table 2).

6. Concluding Remarks

Haier’s adoption of new ICTs and its internationalization process show that: (1) the adoption of new

Table 2. Comparison of Haier's performances before and after BPR

	Before BPR	After BPR	Improvement
Market responsiveness:			
(1) Delivery time of refrigerators	9.5 days	6.5 days	-31%
(2) Average delivery time of all products	36 days	10 days	-72%
Logistics integration:			
(3) Amount of Suppliers	2336	840	-10% ¹
(4) Percentage of international suppliers	<50%	>70%	>20%
(5) Supplying punctuality	95%	99%	4%
International market expansion:			
(6) Export growth	US\$ 280million(2000)	US\$ 420million(2001)	175%
(7) Overseas sales agents	NA	38000	--
Capital turnover:			
(8) Cash turnover period (days)	NA	NA	-84%
(9) Row materials turnover period (days)	32	12	-63%
Direct benefit from BPR:	NA	US\$415 million	--

¹: -10% refers to annual purchasing cost reduction.

* Source: Haier group statistics, 2002.

ICTs that provides ICT infrastructures and management solutions has facilitated Haier's BPR, and BPR makes it possible for Haier to expand internationally through lowering the cost of logistics, manufacturing, and marketing via interconnected B2B, B2C, and Intranet networks; (2) the development of Haier's ICT networks not only innovates the ways of materials purchasing and products marketing, but also becomes the major channels of the enterprise's brand and cultural marketing, which again makes the international process much easier and more powerful; (3) the adoption of new ICTs is of extremely importance for information and technology intensive enterprises like Haier, and the worldwide sprawling R&D networks linking information-intensive centers of the developed countries is the basis of Haier's internationalization.

At the same time, we should not over-estimate the first-mover advantages from the adoption of new ICTs. The BPR supported by new ICTs not only brings great costs to enterprise operation, but also needs comprehensive innovations of the enterprise itself and favorable local milieu as well. The experiences of Haier can be understood only with concur-

rent studies of its special trajectories and innovative milieu, which help Haier become an internationally recognized enterprise even before its intensive adoption of new ICTs. Due to the lack of sufficient fieldwork, in this paper, we could not figure out the exact contribution of ICT adoption to the international expansion of Haier. Further fieldwork and more complete evaluation models are needed for future researches.

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Appendix:

Trajectory of global expansion and ICT adoption of *Haier*

Year	Period	ICTs Adoption	Domestic Expansion	International Expansion
1984	Strategy: OBM	NA	Establishment of Qingdao Refrigerator Plant	NA
1985	Management: TQM to OEC ¹	NA	NA	German Liebherr refrigerator technology introduction
1988	Spatial perspective:	NA	Take-over of Qingdao Electroplating Plant	NA
1991	Local development	NA	Establishment of Qindao-Haier Group; Take-over of Qingdao AC plant & Ice-Box Plant	Refrigerator technology alliance with Mitsubishi Heavy Industry; Registered trademark in United Arab Emirates (UAE)
1992	Strategy: Diversified development	Internal information center	Take-over of Qingdao Condenser Plant; Renamed as Haier Group	NA
1994	Management: External take-over	NA	NA	Established international design institute with GD in Tokyo
1995	Spatial perspective: Domestic expansion and international initiative	NA	Establishment of Haier Industrial Park; Take-over of Red Star Electrical Appliance Plant; Purchase of Wuhan Refrigerator Plant; Establishment a Trade Company in Hong Kong	Hong Kong (Marketing); Export to US market through OEM
1996		Corporate Website	NA	Haier Sah-Polo (Indonesia) Co. Ltd (Manufacturing)
1997		Call center	Shunde Haier Electrical Appliance Co. Ltd.; Take-over of Qingdao 3 rd Pharmaceutical Plant; Laiyang Haier Electrical Appliance Co. Ltd.; Hefei Haier Electrical Appliance Co. Ltd. Haier (Pingdu) Refrigerator Export Base	Haier-LKG (Philippines) Co. Ltd. in Philippines Haier (Asean) Co. Ltd. in Malaysia Haier-Yugoslavia Industrial Alliance Air-conditioner Joint-ventures in Belgrade, Yugoslavia
1998		Website upgrading; Establishment of Intranet; Internal services & management system; Reengineering of AC dept. (ERP)	Take-over of Zhangqiu Electrical Machinery Plant; Joint R&D Center with CAS; Haier Digital Technology Development Co. Ltd.; Joint Software Co. Ltd. with Beijing Aerospace Univ. Haier IT Industrial Park in Qingdao; Haier Central Research Institute	Strategic Alliance with Philips(R&D); Haier Silicon Valley Design Center in US (R&D)

Continued

Year	Period	ICTs Adoption	Domestic Expansion	International Expansion
1999	Strategy: Internationalization Management: Market-chain-guided Business Process Reengineering (BPR);	Internal information infrastructure development; Reengineering of business flow through Enterprise Resource Planning, ERP)	C3P Joint Lab with Shanghai Transport Univ.; New Industrial Park in Qingdao Development Zone	Cooperation with Lucent (on GSM mobile phone); Cooperation with Microsoft (Venus Plan); Haier (US) Trade Company New York, US Haier (US) Industrial Park South Carolina, US; Cooperation with Toshiba (on AC manufacturing) Haier Middle East branches in Iran and UAE Industrial Park South Carolina, US;
2000	Spatial perspective:	Total EC solution; B2B and B2C	Haier E-commerce Co. Ltd. Qingdao Haier IT Park	NA
2001	To Establish global networks	CRM open BBP open Overseas order management system	Haier International Logistics Center; Haier (Dalian) Industrial Park;	Haier (Pakistan) Industrial Park in Pakistan Cooperation with Ericsson (network appliances); Haier (Milano) Marketing Center in Italy Haier (Lyon) Design Center in France Haier (Amsterdam) Design Center in The Netherlands Take-over of a refrigerator plant in Padua, Italy Haier Regional HQ (America) in New York, US
2002		Integration of different networks; Third party logistics information system; Order execution HQ	Expansion of Haier (Qingdao) Information Research Park; Introduction of international suppliers such as Emerson and Sanyo to Qingdao;	Sanyo establish a branch in Haier (Huangdao) industrial park Emerson a branch in Haier (Jiaozhou) industrial park

Source: Haier group, 2002.

¹: overall; every day, everything; every one; clean, control.