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Processes in Four Software Companies in
Dalian, China: Commonalities and
Differences

Yan Zhang[i] and Nozomu Kawabata[ii]

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[i] Graduate School of Ecnomics and Management, Tohoku University, 27-1, Kawauchi,
Aoba-Ku, Sendai 980-8576, Japan, E-mail: yan_zhang315@yahoo.co.jp
[ii] Graduate School of Ecnomics and Management, Tohoku University, 27-1, Kawauchi,
Aoba-Ku, Sendai 980-8576, Japan, E-mail: kawabata@econ.tohoku.ac.jp

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Abstract

This study aims to determine the nature of entrepreneur behavior, business creation, and transformation of software companies in Dalian City through case studies.

Four companies that were launched in the 2000s were studied. These companies' businesses initially involved labor-intensive processes of offshore software development for the Japanese market. However, they were confronted with the challenge of business transformation after the global financial crisis. Their set agenda included forays into high-grade processes, diversification of products and services, and exploitation of the Chinese market.

All four companies tried to transform themselves by creating a unique advantage. The development of such an advantage was a focal point for the software companies to transform their business structure that relied heavily on labor-intensive offshore development. The acquisition of high-grade human resources was an important factor for gaining this advantage.

In the field of offshore development for the Japanese market, cross-border cooperation across processes was necessary to advance into high-grade processes. The "on/off-site" hypothesis was valid, while having a Bridge System Engineer (BSE) in the company was not a prerequisite.

Differences were observed across the four case studies. In China, Japanese-affiliated companies approached other Japanese-affiliated companies, while Chinese companies approached other Chinese companies. Moreover, the disparity of resource availability for transformation was large between big companies and small- and medium-sized companies. As a result, a difference was observed in the strategy employed by the companies for transformation, especially in personnel management in the face of high liquidity in the labor market in China.

1. Introduction

(1) Issues and Perspective

In a previous paper, the authors presented an explanation of how the software and information services industry in Dalian, China was built. The industry formation was actualized through the execution of the local government's industrial policies, the entrepreneurial formation of local companies through various routes, including brain circulation, and the foreign companies' expansion

into China. All factors operated in coordination with one another (Zhang & Kawabata, 2012). However, concerning the specific processes involved in local company formation, the authors were able to study only the three largest local companies. Further, regarding the entry of foreign companies into the market, they were able to provide just a broad outline of offshore ordering by Japanese companies and their entry into the Dalian market.

As of 2011, there were 1,200 software and information services companies in Dalian.[1] Among them, there were only 13 companies (1.1%) with 1,000 or more employees, 68 (5.7%) with 300-999 employees, 324 (27%) with 100-299, and 759 (66.3%) with fewer than 100. The average number of employees per company was 104. Considering the sales figures, while only 77 companies (6.4%) generated yearly sales revenue of 100 million yuan or more, 488 companies (40.7%) had sales income of less than 1 million yuan, with the average annual income being 5.88 million yuan. A point of interest is that while 78% of all software companies in the city exhibited commercial profitability, only 36% of those earning less than 1 million yuan were profitable, suggesting that differences in company size may merit focus.

Regarding investor types, the 307 foreign companies (excluding those from Hong Kong, Macao, and Taiwan) that represent 25.6% of Dalian's software companies recorded higher rates of profitability and export competitiveness than other companies did. They account for 48.6% of sales, 88.2% of exports, and 32.6% of sales profits.

The topic for discussion in this study, which uses a case study methodology, is how the different types of companies constituting the Dalian software and information services industry acted entrepreneurially to create new business and to cope with any problems related to business transformation as they grew. Through this discussion, the formation, development, and process of change in this industry may appear more palpable. With regard to the industry in Dalian having grown as a base for offshore software development services for the Japanese market, this study focuses on how a system to manage offshore software development might be organized when stages of the development process are split between Japan and China. The study also assesses how the business of those companies might diversify away from its dependence on offshore software development for the Japanese market. In so doing, we will evaluate the commonalities and differences in business creation and transformation processes by differentiating the companies according to their scale, that is, whether the company is large or small-/medium-sized, and by investor type, that is, whether the company is local or foreign.

In this study, the facts of each case are derived primarily from the records of interview surveys that took place in August 2010 (the E Company) and August 2011 (the XA, BD, C, and E Companies), and these data were supplemented with publicly available information about each company. The names of the companies have been, and will be kept anonymous, and the findings, including any possible misrepresentations, are entirely the responsibility of the authors.

(2) Literature review

This section reviews case studies from previous research, a method commonly employed by some industry researchers in Japan, on offshore software development in Dalian as well as across China.

The results of all the studies of Chinese offshore software development companies since the latter half of the 2000s indicate that Chinese companies are advancing beyond labor-intensive coding and unit testing into highly skilled areas of the development process, such as requirements definition and outline design (JILPT, 2006; Takahashi, 2009; Umezawa 2005, 2007, 2011; Xu, 2006). Consequently, almost all the research correspondingly highlights the importance of human resource management in securing highly skilled talent.[2]

Takashi Umezawa was the first researcher to perform a series of studies and propose a perspective. According to Umezawa (2007), when a software company in China receives a Japanese order for offshore development, it requires "on/off-site development"; that is, a part of the work has to be performed in Japan with the Japanese customer, rather than the entire work being completed in China. Further to the detailed design stage, even offshore development requires that some work be done in Japan and information, like dealing with specification changes and answering questions, be exchanged with stakeholders in Japan. Moreover, if the company participates in upstream phases like requirements definition or preliminary design, a systems engineer from the company or its Japan branch may be stationed at the client's office, or the development may take place at its Japan branch. Thus, a combined on/off-site approach to development becomes necessary. Furuya (2008) adopted a very similar perspective to the one Umezawa developed from his case study findings. He has identified the key challenge in offshore development management on how to minimize the cost of communicating design information alternating between Japan and China. The current study continues this line of investigation.

It is, however, important to note that as his research advanced, Umezawa's opinions changed regarding the role of the bridge system engineer (BSE), a person who coordinates the onsite and offshore development. In his 2005 study, Umezawa distinctly proposed that international travel was essential for a BSE; however, since his 2011 research, he no longer sees international travel as necessary, or the role of BSE as vital. This has led to the unresolved problem of how an argument for the "on/off-site development" model can remain valid when the arguments for the BSE role have been challenged.

Studies of companies in Dalian can be split into two groups. One investigated whether the Dalian companies entered into the more technically sophisticated stage of software development operations (Gao, 2010; Habuchi, 2010; JILPT, 2006). The other emphasized the differences in strategies adopted by companies according to their scale (Organization for Small & Medium Enterprises and Regional Innovation, Management Support Information Center, 2007). According to the results of

this latter research, which are important to this study, companies with 100 or fewer employees specialized in uncomplicated tasks like coding, as subcontractors to Japanese companies. As the companies expanded, they oriented themselves toward proprietary software package development, IT outsourcing for the Japanese-affiliated subsidiaries in China, and technically advanced stages of the development process. The view that strategy differs with company scale provides a basis for part of this study's investigation.

Case studies of IT technical expert hiring practices are quite limited. Among them, Mizuki Kobayashi observed from a study of 3 companies in Shenyang and Dalian that, characteristically, all the companies "deploy more internally developed personnel in the operations of Japanese companies that give importance to developing staff internally and deploy more externally hired personnel in the operations of European, American, and Chinese companies, which assign significance to software development results" (Kobayashi, 2012, p. 172). However, this finding does not eliminate the possibility that other factors may influence personnel policy. Building on previous research, we decided to focus on how volatility in the Chinese labor market, company scale, and investor type may influence personnel policy.

2. Case Studies

(1) The XA Company: A large local company[3]

    1) Company overview

The XA Company is a local entity capitalized with 100 million yuan, and 100% owned by the X Group. As of 2012, the company has more than 2,000 employees (XA website). The X Group is a major private real estate company in Dalian and is the parent company of Software Park (SP), which makes up the center of the Dalian Hi-tech Zone. In Dalian in 2011, the XA Company was among the top 20 exporters of software, and among the top 10 in sales of software products, data processing and administration services, and software services outsourcing (Dalian Institute of Software & Service Outsourcing, 2012, pp. 152-157). It is a CMMI (Capability Maturity Model Integration®) Level 3 certified organization.

    2) Founding and growth process

The XA Company was originally SP's IT Business Department, established in 2003. SP's IT Business Department developed technical experts and deployed them as programmers and engineers at SP tenant companies, as part of SP's strategy to increase its market predominance. After a defined period, these consultant programmers and engineers were transferred to the tenant companies as full-time employees. The IT Business Department expanded substantially; and, because it grew to be very different from SP's other departments and businesses, it was spun-off in 2006 as an independent

entity called the SPA Company. It started retaining its employees, who began providing services on behalf of the new company. At the time of going independent, along with the IT Business Department with a few hundred employees, SPA acquired SP's Outsourcing Solutions Center (OSC) and its subsidiary in Japan. The role of the OSC department was to manage requirements between new SP tenant companies and customers. The number of these OSC employees was small, but they all possessed Japanese language ability and 2-3 years of IT experience. SP remained embedded in the SPA Company name until 2009 after which it became completely independent, changing its name to the XA Company.

The XA Company, in order to secure technology and personnel for its growth, engaged in acquisitions. First, it acquired a company in Chengdu that possessed a mobile communications protocol that, it believed, could spread in China in the future. It also acquired two Japanese companies. One was acquired to assimilate its personnel who could speak both Japanese and Chinese. Its employees included 40 BSEs. The other was acquired for its visible light communications technology apart from its personnel. In addition, XA also acquired a local embedded software company.

3) Changes in the business structure

SP's IT Business Department engaged mainly in subcontracted application development and in business process outsourcing (BPO), but it began to strengthen its consulting capabilities with an eye on participating in more advanced phases of the development process. When the company changed its name from SPA to XA, it added technology design and consulting to its historical business domain that had been limited to outsourcing services. With regard to classification of business, information technology outsourcing (ITO) had decreased to less than half, while BPO had increased. It also began marketing services to domestic Chinese, European, and American companies in addition to its historical targeting of the Japanese market. At the time of this study, however, Japan still accounted for 70% of its operations.

Among Company XA's operations, the services for Japan are divided into 5 groups: onsite and offshore application development and maintenance (ADM), as per the services explained above; information management services (IMS); embedded software development (EBD); BPO operations; and product engineering services (PES) focused on computer-aided-design/computer-aided-manufacturing (CAD/CAM). These services had originally been conducted in parallel with each other, but because of the reduction in application development in the wake of the 2008 financial crisis, the BPO and IMS businesses have received a relatively higher priority since 2011. The BPO business has expanded, for example, with staffing for subscription processing services for Japanese mobile phones reaching a scale of about 650 jobs. At XA Company, IMS, as BPO requiring IT knowledge, includes technical support/help desks and

system operation monitoring. Taking advantage of its extensive experience in ITO, the company makes effective proposals in BPO. In the company's opinion, conducting BPO operations in China not only reduces unit prices but also increases efficiency.

4) The management of offshore software development

When orders are received from Japan for offshore development, the requirements definition and preliminary design are usually conducted in Japan, and detailed design, coding, and unit testing take place in Dalian. However, Company XA participates in the requirements definition and preliminary design phases in Japan, and partners with the client to create the technical specification. When such work takes place in Japan, various models are possible, such as XA sending an SE to work at the client site or working on the design at XA's Japan subsidiary, XAJ. The purpose is to reassure the client, as is XAJ's hiring of Japanese technical experts; and, some clients want their contracts to be with the Japanese branch. XAJ is entrusted with the responsibility of consulting, sales, and temporary provision of onsite technicians to clients. Project leaders (PLs) and SEs sent by XA or XAJ to the Japanese client subsequently move to Dalian after the upstream phases. In Dalian, they supervise the offshore development team. Although at XA, the people performing this role are called BSEs, they are not merely mediators of information.

5) Strengthening research and development, and hiring and retaining personnel

XA has a research institute inside the company. This institute has laboratories to facilitate research in embedded applications, cloud computing, and mobile technology. Besides, it promotes research and development in partnership with Chinese research institutes and universities.

XA recruits and hires talent from all over China and Japan. In addition to the Chinese employee turnover rate being high, it has become even more difficult to retain talent because the New Labor Law of 2008 made it possible for individuals to quit companies freely. XA focuses on the development of its personnel and also employs external recruiters to identify high-level talent. Believing that employees are not interested only in money, but also in feeling motivated, having future opportunities, and finding the work worthwhile, XA also tries to improve retention through, for example, new employee training and project training.

(2) The BD Company: A major Japanese electronics company's software subsidiary[4]

1) Company overview

The BD Company, a 100% owned subsidiary of the B Company, a major Japanese electronics manufacturer, was established in 2004 in Dalian Software Park in the Dalian Hi-tech Zone. It has a capital of US$ 2.38 million and engages 320 full-time employees. In addition, there are about 100 people on assignment from B's business partner companies. In Dalian in 2011, BD ranked among the top 20 companies for software exports, in the top 10 for software product sales, and in the top 20 for

sales of software service outsourcing (Dalian Institute of Software & Service Outsourcing, 2012, pp. 152, 153, 157). The three reasons the company preferred to operate in Dalian were its geographical proximity to Japan, the availability of high-quality Japanese-speaking personnel for hire, and its system of preferential tax treatment.

2) Business structure

The company's primary business is the development of embedded software for B's products: B brand digital TVs, audio equipment, DVD players, telephones, etc. In addition, it develops software for loading into semiconductors, for lighting systems at Olympic venues, for municipal energy management solutions, and for B's internal administrative applications. More than 90% of its work is outsourced from the B Company in Japan, and the remaining 10% is from B's business units in China. While BD generally does its own development, it also outsources some development to local companies.

3) The management of offshore software development

While creating a requirements definition is essentially the client's responsibility, staff are occasionally deputed to the client site, and sometimes the client travels to Dalian to conclude the activity. System design, programming, and testing take place at BD's office in Dalian. Communication during those stages of the process takes place mainly via video conference and email, with occasional trips to each other's offices. At BD, project leaders are referred to as BSEs. They are not only capable of communicating in both Chinese and Japanese, but they lead daily progress reviews and software development as engineers capable of advanced design. When the company was first founded, BD was only able to contribute in simple tasks like unit testing. However, now experienced engineers are enabling its engagement in design work.

Generally, BD always conforms to its committed deadlines; and, since 2010, its software development productivity (software development efficiency per engineer person-month) has been above the average for the Japanese domestic software companies that are vendors to B, and it is aiming to surpass that average by 20% in 2011. Furthermore, the development cost efficiency relative to Japan, that is, the relative rate of the cost of developing the same software completely in Japan to BD's cost of development, has currently reached 180%, and BD is working toward raising it to 200% at the earliest. In other words, even with the overhead costs associated with offshore development, BD is still trying to be able to develop software at half the cost of developing it in Japan. To offset rising labor costs in Dalian, the company will increase development productivity and outsource work to other places in China with cheaper labor costs.

4) New business development

The company's medium term plan includes three objectives: to expand its businesses in China, strengthen its software development process, and to put into practice a quality management system (QMS).

First, BD has a plan to raise the percentage of sales for China-related business. It is currently 50%, but it is targeting 65% in 2013, and 75% in 2015. It is aiming to expand in growing business fields by collaborating with the Dalian municipal government. In addition, the growing Chinese market is an attractive target for new products for which BD is aiming to develop software, primarily in the areas of energy management solutions, digital broadcasting and communication services, automotive systems, healthcare, as well as related internal administration systems for the B Company. The B Company also sells semiconductors with embedded software developed by BD even to the Chinese home appliance manufacturers to increase the sales.

Next, there are several reasons that require the development process to be strengthened. Unless the product meets the Chinese specified standards and regulations, it cannot be sold in China. To avoid this problem, the headquarters of the B Company in Japan needs to cooperate not only with BD, but also with other subsidiaries in China. Furthermore, given the difficulty in understanding Chinese customer preferences in detail, completion of requirements definition phase in Japan is becoming irrational. It illustrates the need of collaboration between B and BD.

Finally, improvement of quality management is necessary to expand BD's business in the Chinese market. BD is attempting to obtain a CMMI Level-4 certification for the entire company. Moreover, it is putting PDCA (the plan-do-check-act cycle for continuous improvement) into practice, based on key performance indicators.

5) Recruitment and development of human resources

BD offers an annual technical training class for around 30 students each at three Chinese universities: Northeastern University, Jilin University, and the Dalian University of Technology. New graduates from those universities occupy 70% of BD's new fresh recruit. The two-month duration classes are scheduled from May to July on workday evenings or Saturdays, and they facilitate discussion on a problem posed by the Japanese company for which the technical training is organized. In 2011, the challenge was to develop a music player for Android, and the solutions of all the teams were of such high quality that it was difficult for BD's general director to believe they were created by third-year college students in just 2 months. BD advocates that its development productivity surpasses that of Japan because of the excellent quality of the university students it hires.

In the 7 years since its inception, the development of technical experts at BD has primarily been led by people assigned from Japan providing on-the-job training (OJT). Additionally, as an incentive, team leaders and project leaders are frequently sent to Japan, an assignment for which being selected

is a matter of pride. The results of this approach are discernible in the growth of the first- and second-year student hires. In addition, BD hires experienced persons, both in Japan and locally in China.

BD recommends the employees to pass level 1 of the Japanese-Language Proficiency Test after four years of graduate hiring, because they have to communicate with clients in Japan directly using the Japanese language. This employee group shows relatively high attrition rate because of the his/her inability to attain such level of proficiency. Additionally, there are personal reasons such as looking for a marriage partner in their hometown. However, as long as resignations are limited to a few employees leaving after working for three or four years, BD does not get perturbed because their work can be subcontracted. The employees with more than four years' experience do not resign as they adapt to the B Group's corporate philosophy. It means they are not attracted to other companies with slightly higher salaries.

(3) The C Company: A local small-sized company[5]

1) Company overview

The C Company is a local company founded in 2004 with 100 million yen in capital and has 180 employees. A Japanese IT vendor invested 2.5% of the capital, and employees hold 10% stake in the company. The headquarters are located in Dalian Software Park in the Dalian Hi-tech Zone, and there is a branch office, the CJ Company, in Yokohama, Japan.

The founder, Mr. H, is a graduate from the Dalian University of Technology. He spent 2 years in Japan as an IT trainee and after returning to China, worked in the IT industry. Later, he co-founded this company with five others. All six founders were computer experts with training experience in Japan. The company started out with a little over 10 employees.

2) Business structure

The C Company is mainly engaged in offshore IT services for Japan and provides IT services to Chinese companies. Japan accounts for 80% of sales. The IT services for Japan, in addition to offshore software development, include the provision of services such as Chinese localization of Japanese software products and Chinese marketing support. Regarding IT services for China, the company provides comprehensive service packages from consulting to system design, coding, and system implementation management. In addition, they develop software products and provide BPO services, albeit only five employees are devoted to BPO.

The development projects vary in scale from 2 to 200 person-months. C has a CMMI Level-3 certification and an independently developed form of PDCA quality management methodology. Specifically, the PDCA cycle has been thoroughly implemented through analyzing quality trends and their causes, based on charts about person in charge, difficulty, workload, and test results in each

function of projects.

3) The management of offshore software development

Most project orders are received through 5-6 primary vendors with whom C has well-established relationships. Japanese customers like to contract with the Japanese branch so that any potential problems could be resolved locally.

C employs three patterns for its offshore software development business. Pattern 1 consists of only coding, unit testing, and troubleshooting; hence, for the Japanese customer, the cost savings are small, but implementation is easy and low-risk. In Pattern 2, the preliminary design, detailed design, coding, unit testing, integration testing, and troubleshooting take place in China. For the Japanese customer, the cost savings are good, but because this pattern requires extensive knowledge of the business and design ability, it involves a high degree of difficulty for the Chinese side. In this pattern, coordination between C Company and the customer is extremely important. Pattern 3 represents a kind of contract for a dedicated offshore development team, in which, upon receiving a request from the Japanese customer, a dedicated Chinese team manages the research, design, coding, and testing. Trust between the companies is a premise for this pattern, which can also be said to be an extension of Pattern 2. Quality and productivity are high, and cost effectiveness is extremely good, but the Chinese team must be knowledgeable about the business and possess excellent design capability. C considers that communication problems, and not just the technological or business challenges, are often the cause for offshore development failures. To manage this risk, they regard communication between the Japanese and Chinese project managers (PMs) to be very important.

In addition to Patterns 1 and 2, there are many intermediate variations of C's offshore development for Japan. C attempts to expand its participation into the more advanced stages of the development process. However, as the company receives its orders through primary vendors, there are few opportunities for it to contribute in requirements definition.

C copes with fluctuations in work volumes by sharing staff with its three partner companies, which implies that, in total, it has access to 300 technical personnel.

CJ, the country branch and the base of operations in Japan, collects information, conducts sales activities, prepares contracts, and provides IT services to Japanese customers. All of CJ's 30 employees are called BSEs, mostly assigned from Dalian, with five people having being hired in Japan. When a project includes preliminary design, it is primarily managed by CJ's BSEs at the customers' offices, but an additional scenario is that some employees from the main office may be deputed to Japan on a short-term assignment. Subsequently, the software is developed offshore in Dalian after which a BSE from CJ supervises the acceptability checks, release, troubleshooting, if any, and on-going maintenance, etc. As a result, the company specifies the desired personality and language skills as mandatory criteria to becoming a successful BSE in Japan. Additionally, technical

ability and business knowledge are considered necessary. Understandably, in many cases, a BSE deputed to Japan may know nothing about the customer's business, and needs to gain that perspective onsite.

4) In-house product development

C is investing in efforts toward in-house development and offers products such as corporate information management systems, sales management systems, and sales support tools. The information management systems are products based on management systems for use within a company. Japanese companies are the target customers. Sales management systems target Chinese companies with the selling points of price and usability. C's sales support tools are designed for the iPhone, and they enable the consolidated management of client data, the support of daily sales activities, and the sharing of personal contacts. A characteristic of these tools is that all information is maintained on a server, and none is stored on the phone itself.

5) Business changes and diversification

C envisages growth in the IT services in China. It forecasts the future business framework to be equally constituted of Japanese and Chinese, and plans for both the Japanese and Chinese businesses to expand rather than for the Japanese business to shrink.

6) Recruitment and development of human resources

C hires many more graduates from university than experienced professionals because graduates are easier to train. However, as people with special knowledge or technical skills are also needed, the hiring of such persons is increasing. In order to retain employees, C creates a supportive corporate climate. Individual development plans are made with each employee. Japanese language instruction used to be provided internally, but for the last 2 years, instructors from the Dalian University of Foreign Languages have been invited. The instructors teach lower competency level employees 3 times a week and intermediate and advanced level employees twice a week. Employees currently hold 10% of the company's stock, but C is trying to increase that to 30%. Its retention policy has enabled C to restrict employee turnover at 7-8%.

(4) The E Company: A small-sized Japanese-owned company[6]
1) Company overview

The E Company was founded in October 2003 in Dalian Overseas Student Pioneer Park with a capital of US$ 226,000, and it has 45 employees (as of August 2011). It is a Japanese company having a Chinese board chairperson, Mr. K, and a Japanese general manager, Mr. L. In order to save on remittance fees, a Japanese branch was formed in August 2008.

2) The company's inception

Mr. K, the board chairperson, lived in Japan for over 20 years because his father was employed there. Mr. K originally worked at a trading company specializing in foodstuffs, and as he was responsible for purchasing imports for Japan, he gained experience in various operational functions such as production management and customs clearance. He founded the E Company on his father's recommendation. Since his university major was in the liberal arts, he had no skills related to software and learned the business on the job. When he founded the company, the demand in this industry was strong, but because Mr. K had no personal networks in the software field, he was faced with challenges in securing business. The general manager, Mr. L, was originally employed at a major Japanese manufacturer of electronics, where he was responsible for mechanical design. In 1994, he was assigned to the development department at the Dalian branch, where he was in charge of the motor business. In 2002, he took up permanent residence in Dalian. His venture into the IT world was facilitated by a friend he had met while working in Japan. Hailing from the Dalian University of Technology, that friend founded a company in Dalian in 2002, and Mr. L went to work there. Subsequently, in 2003, he co-founded a different company with his friend to conduct offshore software development for Japanese companies. However, he quit in 2007 and joined E.

3) The management of offshore software development

Until 2008, E's main line of business was typical offshore software development, for which secondary IT vendors in Japan provided it the orders for part of the software development process.

In the main pattern of E's offshore development, the technically advanced stages of requirements definition and preliminary design, as well as system development and maintenance, are effected by senior vendors in Japan, while coding and unit testing are conducted by E in China. When orders are received from Japan for offshore development, a non-disclosure agreement is first signed with the customer. Because Japanese customers often change the technical specifications midway through the project, the E Company tries to set higher quoted price to cover that cost; subsequently, E negotiates with the customer as to who should bear the cost of specification changes to prevent losses.

It used to be that the Japanese-speaking BSEs at the E Company, who were responsible for overseas sales, played the role of mediator between the customer and E. However, now that E's PMs and PLs are able to speak Japanese, BSEs are no longer required, and the usage of that term has been discontinued. E emphasizes that the SEs have to rely on them even though BSEs do not understand the technology. the role of BSE carries no responsibility What makes it worse, the role of BSE carries no responsibility. Consequently, it is unclear who will take the ownership for mistakes.

4) Business transformation and in-house product development

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The E Company believed that it was difficult to be profitable by only doing offshore development for its Japanese client, and its personnel were not gaining in expertise. Hence, when orders dropped suddenly during the 2008 financial crisis and the company started to lose money, it changed direction and started to pour efforts into selling software packages developed in-house. Further, it entered and then exited the BPO business, because being a secondary or tertiary subcontractor was not very profitable.

E started focusing on in-house development, capitalizing on the Japanese language skills acquired during offshore development for Japanese companies and on the expertise Mr. L had in manufacturing and production management. First, it sold production management packages and then diversified into products for personnel evaluation and for managing purchases of equipment and tools. E accorded special attention to sales because, in contrast to software development subcontracting, in the packaged software business, once the development is completed, revenues and profits grow with increase in numbers of customers. Their target customer base is mainly small- and medium-sized enterprises (SMEs) in the Dalian Development Area (DDA) and in regions that are trying to attract Japanese companies, like Qingdao and Tianjin. Sales approaches include accessing directories from the chambers of commerce and industry to make cold calls to potential clients, and to request acquaintances from other companies for introductions. In 2010, the cost of labor at all companies soared because of strikes targeting the Japanese companies in DDA, which affected E's revenues as well. Meanwhile, sales to local Chinese companies are difficult for the Japanese-affiliated SMEs like E because of factors including collection of account receivables and conflict management.

5) Recruitment and development of human resources

Because E cannot compete with large companies in the scale of funding, organization, or sales networks, it is trying to overcome these challenges by providing employees with business education, using component-based development, and hiring excellent sales people. In particular, E is paying attention to hiring and developing personnel. Among its 45 employees, 40 are responsible for development and 5 for business operations support. This workforce strength is the result of distilling down what was once a staff of 100 to the more capable employees. The average employee age is 29.8 years with 6.1 being the average years of experience.

The E Company hires only experienced professionals. This is because new graduates hire need to be trained for a year before being able to assemble a program for a customer, and it is a major setback to the company when they resign after training. In order to cope with the volatility in the labor market and employee turnover, E focuses on the employees' futures for retention of personnel. In addition to offering various compensation incentives, such as salary increases and bonuses, E invests in developing all employees so they can excel in their field of work. Mr. L requires that they

study technology and management and emphasizes that "They could all be future company presidents." After joining the company, they are trained in business etiquettes followed by a new employee orientation and education in sales, support functions, leadership, project management, etc. Employees whose roles are restricted to only coding and unit testing for offshore development will learn nothing about the end user and never be able to write a technical specification. For that reason, the business transformation to development of software packages was an opportunity for employee growth while also being a challenge. By the time they started developing software packages, Mr. L provided basic instruction to the PLs for 2 hours every day for 3 months; and, all the PLs, in turn, passed that knowledge on to their staff.[7]

3. Discussion

(1) Commonalities and differences

　　We have observed from the case studies of these four Dalian software companies that as they transformed their businesses, there were some commonalities as well as some differences related to company scale and investor type. We believe this study makes the following contributions to the research literature.

　　All four companies presented in this study initially engaged in offshore software development for the Japanese market, providing labor-intensive components of the process like coding and unit testing. Until 2011, when the interviews were conducted, they were dealing with structural changes to their businesses as they pursued growth by advancing into more technically sophisticated levels, expanding their services and product offerings, and diversifying their target markets, in particular, by cultivating the Chinese domestic market. Moreover, at XA and E, the need to raise the level of companies' technical skills as a catalyst for change was reinforced by the external stimulus of the financial crisis.

　　All the four companies were attempting to achieve transformation by leveraging their unique strengths. XA and BD were trying to achieve levels of productivity in their Dalian operations that could surpass that of Japan; C was laying emphasis on communication and quality; and E was trying to integrate lower production costs with its business management expertise. For Dalian software companies, the achieving of predominance over other companies is an issue of transforming a company's business model away from offshore development dependent on low labor costs. Moreover, the strategy for recruitment and development of human resources to cope with the volatility in the labor market is the key to maintaining and expanding this market dominance.

　　When upgrading the offshore software development business for Japanese market, a company's base in Japan plays an important role: BD, fortunately, had its parent company and customer, the B Company, in Japan, and XA and C found it necessary to establish Japanese subsidiaries. This kind of

transnational division of labor, both within the company and in the stages of the development process with the customer, is inevitable given that some parts of the business, such as sales, contracts, requirements definitions, and preliminary designs are performed in Japan, where the customers are located. Coordination between a company in Dalian and its base in Japan is, therefore, important. These findings support Umezawa's (2007, 2011) "on/off-site development" perspective.

Regarding who should be responsible for this coordination, the results suggest that the PM or PL of the development team and each level of engineer should assume direct ownership for communication in Japanese. In practice, these people are sometimes called BSEs. However, at other times, this reference is avoided. In the one case where a specialist position called the BSE was established to mediate in communication, it was viewed as an immature and problematic approach. In other words, while transnational coordination across stages of the development process is essential, the position or title of BSE is not. Sorting out this issue may make the "on/off-site development" perspective more consistently applicable.

The study also observed the different approaches of the four companies. First, Japanese-owned companies and local companies differed in their methods of expanding their businesses into the Chinese market. While BD and E assumed that the Japanese-affiliated companies in China would be their customers, XA and C assumed that their customers would be the local Chinese companies. It appears that Japanese-owned companies may perceive the existence of certain barriers in directly approaching local Chinese companies.

Another difference was the large gap in the scale of people and resources that could be mobilized for business transformation. XA grew multi-dimensionally through the effective means of acquiring companies for their technologies and personnel, while BD was able to capitalize on B Group's overall resources for the development it had perceived for the Chinese market. Only a large company and its overseas subsidiaries could do these things. Meanwhile, business diversification for the C and E Companies was concentrated on the in-house development of software packages. This was a feasible strategy for these SMEs because while business knowledge is important for software package development, a huge investment of resources is not necessarily needed to raise the company's skill level. However, access to end users becomes important for the sales activities for these packaged offerings as opposed to subcontracting for parts of offshore software development projects. As C and E were secondary or tertiary vendors in offshore software development for Japanese companies, they did not have access to the end users and did not gain any sales experience. It was important to overcome this challenge, especially for E that had ventured into packaged software as its new main business. Hence, improving the skills of its sales staff became a focus. The analysis of these cases shows that companies adopt different strategies according to their sizes, which confirms the findings of the Organization for Small & Medium Enterprises and Regional Innovation, Management Support Information Center (2007).

In the recruitment and development of human resources, all four companies shared the understanding that in this highly volatile labor market, improving skills leads to changing jobs. However, based on their respective sizes, there was a large gap in how the companies responded to this challenge. BD was resilient to resignations and hired highly skilled new graduates, even getting involved in the administration of university classes. In contrast, E could not afford to spend a year on training any new graduates considering the risk of turnover. The SMEs, C and E, tried to compensate for their disadvantageous salary levels by focusing on human resource development as a strategic issue. Company scale has emerged as a factor explaining the differences in the human resource policies as response to the shared environmental threat of the volatile labor market. This provides an understanding of a different aspect of IT expert hiring practices to add to Kobayashi's (2012) comparison of resource hiring and deployment practices at three large companies.

(2) Future research topics: The international division of labor and business upgrades

This study has generated two issues for future research. The first concerns understanding how the business transformation at individual companies influences the international division of labor in the software and information services industry. We need to acquire a better understanding of the characteristics of Dalian's international position. Moreover, it is necessary to investigate how the position may change in relation to other offshore development bases such as India and large markets such as Japan and America. The second issue arising from this study is the need to improve our understanding of the industry level mechanisms that provide opportunities for individual companies to upgrade their businesses, and to develop the relevant skills. Specifically, in Dalian, software and information services companies are clustered together, and the importance of the cluster is growing in the international division of labor in the software development process. How do both the local system and international system of collaboration and division of labor act as catalysts to promote or constrain a business upgrade or determine its direction? These are the subjects of our next study.

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[1] The statistics in this paragraph are from the Dalian Institute of Software & Service Outsourcing (2012).

[2] In addition to the references cited, the record of a large-scale field study by Chuo University's Software Offshoring Joint Research Team have been published in the journal *Chuugoku Keizai [China's Economy]* of the Japan External Trade Organization (JETRO). Unfortunately, however, the

research team did not provide its views or evaluation of the data.

[3] This section, unless otherwise mentioned, is based on data from an interview with Mr. F, Director of Japan Sales and Marketing for the XA Company, on August 23, 2011.

[4] This section, unless otherwise mentioned, is based on data from an interview with Mr. G, General Manager of the BD Company on August 24, 2011.

[5] This section, unless otherwise mentioned, is based on data from interviews with Mr. I, Director of Human Resources at the C Company and with Mr. J, Senior Manager of Systems Development for the Japan Branch of the C Company on August 24, 2011.

[6] This section, unless otherwise mentioned, is based on data from interviews with Mr. K, Chairman of the Board of the E Company on August 26, 2010 and with Mr. L, General Manager of the E Company on August 23, 2011.

[7] Further, at the time of this survey in August 2011, Mr.L emphasized E's funding constraints, but in the fall of 2011, the company had a funding crisis, which led to the company's liquidation at the end of the year. However, Mr. L, aiming to continue the development of software packages founded a new company and is trying to revive the business alongwith the former employees of E.