

Nano-TEM: An Engineering Entrepreneurial Venture in Corporate Japan¹⁾

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Abstract

In the past fifty years, relatively few startup success stories have appeared in Japan. High failure rates and low average returns of startups signify the challenging business climate and habitat for new business creation in Japan. In this study, we look at an engineering university venture startup company in the Japan machine tool industry. We qualitatively examine the founder's attitude and characteristics that allowed for the company to be rescued from dire conditions on the basis of two hypotheses. The first concerns the importance of accounting knowledge for the entrepreneur and the second addresses the concept of overconfidence as an essential entrepreneurial skill. In addition, our analysis points to the fact that a startup business cannot continue unless its founder has a strong need to sustain it over a long period.

Keywords: *entrepreneurship, venture, startup, machine tool industry*

INTRODUCTION

Nano-TEM Company Limited is a classic example of a spin-off from a Japanese Engineering School in corporate Japan. It was founded in 1988 by Mr. Atsushi Takata, a PhD and researcher at Nagaoka University of Technology, with capital of 10 million yen funded by Professor Kozo Ishizaki (Takata's teacher), System Seiko, and himself. Nano-TEM's products were built around the core technology of porous ceramics, for which Takata was able to register around 15 patents. Takata believed his invention would change the machining industry. He had

the vision that in the future the porous ceramic chuck will become a main component of every machine tool as a cutting and grinding bed.

Being a technology-oriented startup in the machine tool industry, Nano-TEM faced serious challenges due to the rigid Japanese corporate culture and its absence of backing from a mega company. Takata found that it was easier for him to file a patent than to convince Japanese senior management about his highly innovative technology. It takes years for Japanese companies to embrace new technology introduced outside their corporate network.

At times, Nano-TEM was in dire condition and faced bankruptcy. However, thanks to the strong leadership of the president, the company has sustained its position by offering unique products and services. This case describes and analyzes Nano-TEM as well as its founder Mr. Takata's entrepreneurial character with regard to his unique leadership and the hardship a technology startup faces in corporate Japan.

ENTREPRENEURSHIP IN JAPAN

The promotion of entrepreneurship for economic development has always been a central theme in Japanese policy debates. Yet Japan's level of entrepreneurship remains low when compared to other industrialized countries. The IMD World Competitiveness²⁾ ranked entrepreneurship in Japan at 54th among 59 countries. As a part of the Abenomics³⁾ "third arrow" plan, the Japanese government set a goal of increasing the new business entry rate⁴⁾ to 10 percent in its "Japan Revitalization Strategy." Japan's entry rate has been low for two decades and the exit rate⁵⁾ has been higher than the entry rate for several years in the post-bubble period. A great deal of literature has emphasized that high-growth startups stimulate the economy and are expected to lead the economic and social development of a country (Acs & Audretsch, 2003).

Looking back into history, Japan's Meiji government actively pursued the large-scale industrialization of Japan to escape the fate of colonial domination suffered by the Chinese. They did so by injecting capital into major corporations and not allowing market forces to put significant quantities of capital into small businesses (Honjo, 2015). A similar pattern of large-scale industrialization can be observed in the machine tool industry in the post war era (discussed in the next section). However, a shift from the model of a managed economy toward that of an entrepreneurial economy has been experienced in highly developed economies (as in U.S.) and it is positively contributing to substantial economic growth (Audretsch & Thurik, 2001).

In entrepreneurial countries, the activities of established firms and the entrepreneurial sector each share one-third of the national economic

growth, and the remaining third goes to the interaction between these two sectors (Honjo, 2015). Out of 6,500,000 companies in Japan, 99.7 percent are Small to Medium Enterprises (SMEs) which have 1-300 employees (Small and Medium Size, 1999). In addition, 66.1 percent of Japanese SMEs are owner-operated and linked to *keiretsu*⁶⁾. These companies are usually formed and run by retired employees of the *keiretsu*. The remaining 34 percent are financed by third parties (Startups Anticipate, 1999).

Despite the large share and strong culture of SMEs, new venture creation is hindered by numerous variables including Japan's conventional business culture, the tight regulatory policy of the government, and a group-oriented, risk-adverse mindset. Customers see startup businesses as unstable and dealing with them as risky. The Japanese business culture, such as *keiretsu*, contains a complex web of personal and business relationships.

Japanese Entrepreneurs

In the past fifty years, relatively few startup success stories, mostly in the technology field, have appeared. Masayoshi Son, founder of Japan's Softbank, is a leading name in the global internet economy. Kenji Kasahara is the brain behind Mixi, Japan's most popular social networking service. Kentaro Iemoto, CEO of Clara Online, was just 16 when he raised \$10,000 to start his web-based server hosting company. Many successful entrepreneurs are U.S. business school graduates. For instance, Hiroshi Mikitani – Rakuten CEO, Tomoko Namba – founder of DeNA, and Takeshi Niinami – the head of convenience store chain Lawson, are two big names. These cases serve as evidence that spaces are still left for entrepreneurs and startups in Japan's developed but conservative economy.

Equity Capital

Equity capital is an engine of a country's entrepreneurial growth, providing funds to entrepreneurs without exposing them to excessive risk (Helms, 2003). However, the risk-adverse community of Japan prefers the safety of fixed-interest accounts. The government-operated postal saving bank is the common place for the Japanese public's savings which amount to about 12 percent of their indi-

vidual incomes. Those savings generally go to government projects, not to entrepreneurs. Studies confirmed that the country relies on the bank-centered capital market and has relatively little venture capital (Black & Gilson, 1998).

A survey of Japanese companies conducted by Creative Business Activities of Small and Medium Companies showed that 80.1 percent of fund sources for startups were the founder's own contribution, while 41.1 percent consisted of loans from private-sector financial institutions (Yoshioka, 2000).

There are a substantial number of wealthy individuals in Japan. Notwithstanding that, the number of private investors is still low compared to the U.S. Consequently, there is not a solid core of 'angels' providing seed funding to startups. To some extent, the void is fulfilled by Japanese trading houses. However, the investment decision to use capital from these sources is made by employees and the capital tends to go to large scale, risk-free projects.

While more Japanese are getting into equity capital investment, hardly any of them resemble the angel investors that are saviors for cash-starved tech startups in locations like Silicon Valley. That is because few Japanese financiers have any experience as entrepreneurs and tend to avoid getting directly involved in management (Hall, 2006). Richard B. Dasher states that many of Japan's venture capital funds are merely non-bank financing. Japanese venture capitalists tend to make hundreds of investments a year, whereas in the U.S. such individuals are limited in the investments they can make by the number of boards they can sit on. This raises two issues. Firstly, the scalability of business is limited and it is hard for startups to secure capital required for large scale expansion. Secondly, angel investors provide not only the capital but also the intimate coaching with their broad past experience which is essential for the success of a new business.

Entrepreneur Education

Young Japanese are hardworking and highly competent in their particular field. They are fully aware of up-to-date technologies and global advancement. However, they receive relatively little education in general business – finance, accounting, etc.

– unless their higher education is in business administration. Hence, especially for those with an engineering background, they do not see themselves as possessing the necessary competencies to successfully run a business, even though they might have high-potential business ideas. Of the new Japanese ventures, the number of failures is increasing and lack of adequate management knowledge is considered the major cause of these failures (Helms, 2003).

Once a profit opportunity is identified, entrepreneurs tend to neglect the available statistics of similar past and future situations that could help them to form more accurate forecasts of their likelihood of success (Koellinger, 2007). Without the support of angel investors, entrepreneurs in Japan need to take charge of all aspects of running a business. Many startups have failed due to inadequate estimate and financial management.

An interview survey (Cromie, 1991) of 68 proprietors of four-year-old firms regarding the problems they encountered in their early years indicated that small firms frequently experience problems with lack of funds (28 out of 68 firms) and this is exacerbated by slowness in getting paid (18) and cash flow problems (18). In most cases, customers simply delayed payment until the very last moment and the firms didn't have capital or cash to pay for wages and facilities. Some interviewees thought they received poor financial advice, a few were defrauded by employees, and others had bookkeeping and tax problems. One interviewee said he spent 90 percent of his time working on production and the other 10 on the books.

Accounting is a system for the delivery of financial information. Accounting skill was found to be contributory to entrepreneurial performance. It involves the recording of transactions and preparation of financial statements, along with financial statement analysis regarding the financial health of firms (Liu, 2014). It promotes effective decision making, performance evaluation, and business reporting for any business enterprise (Akande, 2011). It gives entrepreneurs the essential information of how their startup business has performed over a given period as well as the financial position of their business at a given point in time (Nwaigburu & Eneogwe, 2013).

Starting a business requires knowledge on a variety of business functions. Among them, accounting is the most important since it offers the basis for managing business. A survey conducted of 100 leading entrepreneurs and chief executive officers in America's fastest-growing entrepreneurial firms (Hood & Young, 1993) identified finance/cash management, engineering, and accounting as the most important areas among 29 specific content areas of knowledge for entrepreneurs. Accounting helps entrepreneurs to forecast financial estimates, to budget expenses, and to determine profitability. Additionally, a sound financial forecast for a new business venture is essential for obtaining outside funding for business startup cost. Creating a sound budget and sticking to it helps entrepreneurs avoid wasting capital on non-essential business items. Keeping an eye on cash flow is essential to feed the bottom-line profits. Despite being able to generate high amount of sales in their own niche market, failing to generate enough profit may doom the business to failure. It is generally true for engineering university ventures where they tend to spend excessive amounts of cash on new product development. Entrepreneurs need to understand how well they are using assets to generate services and the cost of inventory compared with the profit margin (Vitez & Media, 2015). With these facts in mind, we propose the following hypothesis.

H1: Entrepreneurs with profound knowledge of fundamental accounting concepts have higher potential to be successful.

The OECD (2010) highlighted the influence of personal networks and their ability to build entrepreneurship. Through personal networks, entrepreneurs could benefit from increased access to funding by risk capital investors. However, financing is not taken lightly in Japan. Japanese entrepreneurs are reluctant to do so not just because of the fear of losing money but about losing "face." Any failure could lead to a lifetime of shame for the entrepreneur.

A study conducted by Koellinger et al. (2007) suggests that some countries exhibit relatively high rates of startup activity because their inhabitants are more overconfident than in other countries. They emphasized that subjective and possibly bi-

ased perceptions have a crucial impact on new business creation. Camerer and Lovallo (1999) also argued that overconfidence leads to excessive entries.

A survey conducted by Cooper et al. (1988) stated that entrepreneurs expressed an extremely high degree of confidence in being successful despite the data for the actual base rate of firm survival after five years of starting business being comparatively low. Entrepreneurs have a strong tendency to consider their situation as unique. Entrepreneurs tend to categorize equivocal business scenarios more positively than other individuals (Palich & Bagby, 1995). Once they identify a profit opportunity, they isolate their present situation and treat it as an original and unrepeatable event. However, this does not necessarily mean that entrepreneurs perceive and accept greater risk than non-entrepreneurs. The perception of risk may be influenced by one's degree of confidence (Simon, Houghton, & Aquino, 1999). In the context of a decision making process, biases and heuristics are cognitive mechanisms and subjective opinions that guide behavior (Busenitz & Barney, 1997). The confidence that individuals possess in their own entrepreneurial skills emerges as a major driver in the decision to start a new business (Honjo, 2015). For Japanese individuals, who are stereotypically cautious and prudent, overconfidence may be beneficial to some extent, even if their entry decisions represent errors in judgment (Koellinger, 2007). Moreover, it can also be of help in convincing others (e.g., investors, customers, and employees) that a venture will be successful, and thereby aid in enlisting and sustaining their support (Vecchio, 2003). Notwithstanding that, relying on incomplete information and cognitive heuristics may be the only way to overcome the incredible obstacles facing a new firm (Aldrich & Martinez, 2001). Holding a positive view on overconfidence being an essential element of entrepreneurship, we propose the following hypothesis.

H2: Overconfidence plays an essential role for entrepreneurs to start a venture business, especially in the context of the Japanese economy.

In this study, we will look at an engineering university venture – Nano-TEM – in the context of Japan

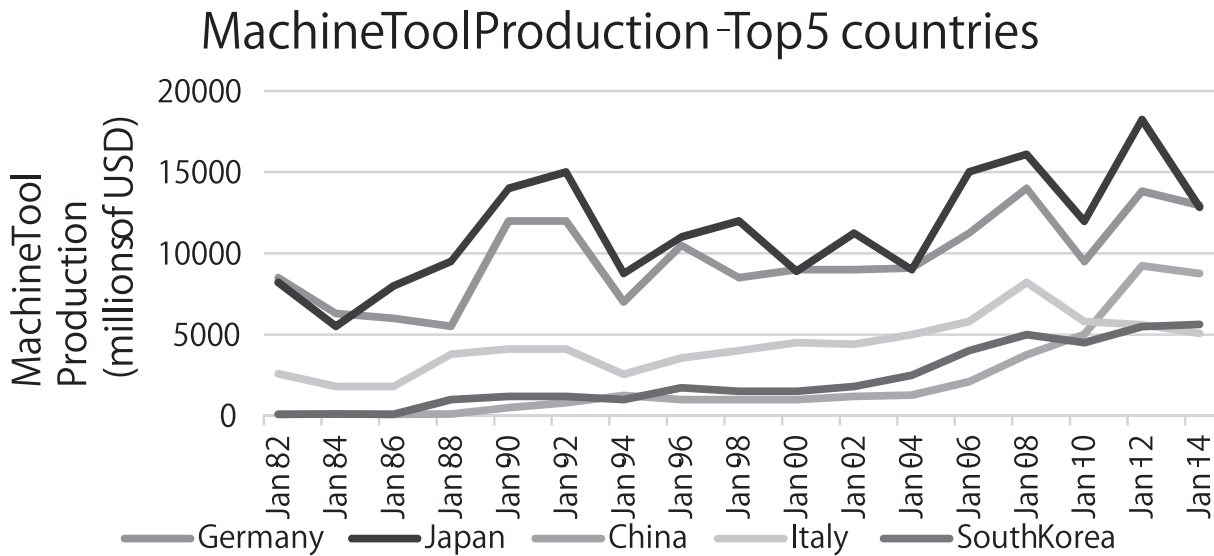


Figure 1: Machine Tool Production
 (Gardner Research, 2014, p. 9) (Gradner Research, p. 5) (Gradner Research, p. 2)

machine tool industry testing above two hypotheses. We will qualitatively examine the founder's attitude and characteristics that enabled the company to be rescued from dire conditions.

JAPAN MACHINE TOOL INDUSTRY

Background

Machine tools are industrial products. They are power-driven machines used to cut, form, or shape metal (Carlsson, 1989). Their precision determines the quality of their manufacturing production. The overall technical standard of a manufacturing sector is thus dictated by the machine tools it uses. Although worldwide sales of machine tools are comparatively small (\$73,735 million in 2004) (Gardner Research, 2014, p. 2), machine tools are an integral and indispensable part of every advanced economy. Machine tools are widely found in the injection-molding of plastic goods so common in today's consumer market.

In 1955, Japan's share of the world machine tool market was 1 percent. Japan overtook the U.S. as the global leader by 1982 and dominated global output. It remained number one most of the time from that time on. Japan exchanged the top position with Germany in some years (Figure 1).

In 1950s, the technological gap between tool makers in Japan and the U.S. was large. The Japanese government passed the 'Extraordinary Measures' law in 1956 to the technical standard of Japan machine tool industry by setting priorities in capital-lending procedures, regulating import licenses, and offering tax incentives. Further, quotas and tariffs on imported machine tools imposed by the Ministry of International Trade and Industry (MITI) effectively protected the industry. With the aim to increase industrial concentration, the Ministry of International Trade and Industry in the 1960s employed a rule that firms were 'encouraged' to drop product lines with less than a 20 percent share of their sales or less than a 5 percent of the domestic market share (Kotha & Nair, 1995). Furthermore, the Japanese Machine Tool Builders Association (JMTBA) established industry-wide standards for tool changing mechanisms and size increments to increase technological compatibility and reduce manufacturing costs. For economies of scale in manufacturing, the development of simple, modular designs was encouraged (MacKnight, 1984). The overlap of parts increased to 10-40 percent and the average number of parts per machine tool was reduced to 30 percent (Kotha & Nair, 1995). These initiatives gradually changed the industry and many machine tool makers became assemblers

with over 70 percent of components procured from other firms. The share of Japan machine tool output gradually increased and reached 28 percent of world output by 1991 (Kotha & Nair, 1995). Such high efficiency and high concentration of the Japanese machine tool industry hindered the entrance of engineering startups and small independent companies.

Technological Change

In the 1970s, the shift to computerized machine tools and standardization led manufacturers to develop expertise in electronics and capabilities in computer hardware and software programming (The machine tool industry, 1987) and facilitated quality advancement. Multidisciplinary teams of mechanical and electronics engineers became essential for new and sophisticated product development (Carlsson, 1989). Such major technological change enabled specialist manufacturers to begin supplying items such as ball screws, numerical control (NC) devices, and hydraulic equipment. The share of NC devices in manufacturing industry reached over 80 percent in 1995. Industrial-wide technological changes increased R&D expenditure to about 8 percent of industry value added (The machine tool industry, 1987).

The Market

For industrial capital goods markets, the unique nature of the buyer-seller interdependence is one of its distinguishing characteristics. The buyers tend to depend on a set of suppliers for components or subassemblies, replacement parts, and skilled repair/maintenance services (Corey, 1991) (Webster, 1990).

The machine tool market can be viewed as a multi-tiered market, matched by a multi-tiered production system (Suzuki, 2015). According to Minoru Sawai's book "The Dream of Mother Machines" (Sawai, 2013), machine tool users in the 1920s can be classified into four groups - 1) major aircraft and electrical machine industry users, 2) major machine industry users in fields such as military equipment, shipbuilding, and rolling stock, 3) mid-size users, and 4) small- and micro-scale users.

Japanese manufacturing firms are generally

conservative and rely on both a machine tool builders' reputation and past relationships in concluding purchasing agreements (JMTBA, 1989). They tend to buy their capital equipment from tool builders who can understand their manufacturing approach, and can respond to their needs effectively in a short time without even having detailed contractual agreements (Carlsson & Taymaz, 1993). Japanese automobile producers, for instance, work in cooperation with machine tool builders to make improvements and innovations in both products and productivity. Additionally, customers tend to buy capital equipment from suppliers who reside in close proximity (and through their corporate network) to ensure availability of replacement parts over an extended period of time and to ensure compatibility with tools already in place (Carlsson, 1989). Once a relationship is established between the buyers and suppliers, repeat orders and long term contracts are the norm.

A survey (USITC, 1983) indicated that, for selling machine tools, (1) exhibiting products in trade shows, (2) personal calls by sales representatives, and (3) disseminating product literature are necessary (shown in order of importance). For simple, low-cost machine tools, regional dealers play a big role reaching out to small manufacturing firms located throughout Japan. For high-quality and high-performance machines tools such as flexible machining centers (FMC) and CNC, firms prefer to deal directly with machine tool builder. A high level of technical knowledge, machine operation expertise, and customization are critical matters in these deals. Japanese Trading Companies ("Sogo Shoshas") are generally used by machine tool builders to reach markets outside Japan.

THE ENTREPRENEUR CHALLENGE

Atsushi Takata

Atsushi Takata received his PhD degree in 1998 from Nagaoka University of Technology (NUT). NUT is a public engineering school renowned for its strong presence in the field of mechanical engineering and its unique relationship with Japanese corporations for joint research activities. Takata engaged in joint research with System Seiko⁷⁾ for

Table 1: Patents and Publications

Patents (partial list)
<ul style="list-style-type: none"> • Process for modifying porous material having open cells (US 5126103 A) • Vacuum chuck (WO 2011065021 A1) • Slide valve apparatus for automatic application of surface pressure and surface pressure application method thereof (WO 2011077912 A1) • Method of improving quality of porous body having air holes (WO 1991001834 A1) • Porous grinding stone and method of production thereof (US 6485533 B1)
Publications (partial list)
<ul style="list-style-type: none"> • Mechanically Enhanced Open Porous Materials by a HIP Process • Advanced thin dicing blade for sapphire substrate • Manufacture of Penetrating-Pores Metals by High Gas Pressure • Influence of Hipping Pressure on the Strength and the Porosity of Porous Copper • Improvement of a Porous Material Mechanical Property by Hot Isostatic Process • Emerging Methods for Micro- and Nanofabrication • Surface mass transport under high pressure inert gas and hot isostatic process for producing porous materials • Effects of hardness of abrasive grains on surface roughness of work piece in PVA bonded grinding wheel

Source: Collected by authors through Google Scholar

porous ceramics and sintering technologies. Takata has registered around 15 patents in both the Japanese as well as U.S. Patent Office. Some of his patents and published research papers are listed in Table 1. Takata strongly believes his inventions will change the world of machining industry. He had the vision that in the future the porous ceramic chuck will become a main component of every machine tool as a cutting and grinding bed.

Nano-TEM Co., Ltd.

Nano-TEM was founded in 1988 with capital of 10 million yen funded by Professor Kozo Ishizaki (Takata's mentor), System Seiko, and Takada. The first president was Mr. Onodera and Takata assumed the presidency after a few months following the company's establishment.

The company's corporate philosophy states "*Nano-TEM creates new values in pursuit of people's happiness.*" For the development and prosperity of client corporations, Nano-TEM exercises its own technology and scientific management practices to provide new value. The company clearly states that they are thankful to customers and shall work along with them. Being a university venture, Nano-TEM takes advantage of its freedom to pursue ground-breaking ideas and concepts, and contributes to the industrial world.

By contributing its innovation and advancement

for the whole process of manufacturing high-tech materials to devices, Nano-TEM pushes the next generation of precision machining technology and systems to its extreme. Takata has clearly defined guidelines for the company's actions as:

- To create new value by acting in a flexible way of thinking and proactive attitude.
- To become a professional group pursuing expertise in the field.
- To meet our customers' expectation, we act with speedy decision making and superior ability of getting things done

Company activities include:

- Manufacturing porous ceramic applied products (machine tool components) such as vacuum chucks for industries specialized in large scale manufacturing and customizing of semi-conductors, flat panel displays, printed circuit boards, simple ceramic plates, air floating nozzles, and light weight structural parts.
- Manufacturing diamond powder applied consumables such as dicing blades, fixed abrasive (pellet) lapping plates, backside grinding (cup) wheels, specialized used in the ceramic substrates industry such as AlN and Al₂O₃ and sapphire substrate related industry such as blue and white LEDs.
- Process services of grinding, lapping, polish-

Table 2: Nano-TEM History

1998 April	The first venture spinoff from National University (Nagaoka University of Technology), Nano-TEM was established with a capital of 10 million yen
1999 October	Development of "Special Diamond Tools"
2000	Received the 5th Tohoku venture land subsidiary Development of "porous ceramic chuck"
2001	Development of precision whetstone grinder "through-feed grinder"
2002 May	For business expansion, the main factory is relocated to Nagaoka Shimogejo 1-485
2002 August	Raised Capital 20 million yen (third-party fund)
2003 Feb	- Obtained certification in compliment Small and Medium-size Enterprise Creation Act - Raised Capital 60 million yen (third-party fund) (Tokyo Small and Medium Business Investment & Consultation Co., Ltd.) - Started business of "Commissioned Machining"
2005 March	Raised Capital 100 million (third party fund) (Tohoku Innovation Capital, Inc.)
2006 September	Raised Capital 125.5 million (third party fund) Tohoku Innovation Capital, Inc.

Source: The company website⁹⁾

ing, and dicing on a variety of hard and brittle materials such as ceramics, glass substrates and crystal materials.

Takata claims that Nano-TEM's products are unique in Japan. Leading ceramics manufacturing companies such as Kyocera do produce various ceramics products but mostly dense body (*chimitsu-tai*). Nano-TEM's products are built around the porous property of ceramics and on its own sintering technology.

The porous property provides several advantages:

- Porous ceramics vacuum chuck used as a cutting bed gives ease of fixing any shape of material on it.
- While offering firm placement of material, the porous bed is flat and smooth enough not to place any strain on a product even one with high pressure on it.
- Water supply through porous whetstone gives balance constant flow of water and enables a highly efficient cutting and grinding process.

The company brochure states that, "We at Nano-TEM contribute solutions to our clients based on our core ceramics sintering technology integrated into four areas of machining - Grinding, Lapping, Polishing and Dicing⁸⁾."

Early Challenges

Nano-TEM started with 10 million yen capital but it turned out that they spent 70 million yen on buildings and equipment, which bled the company and in the second year after establishment, it was in dire condition and faced virtual bankruptcy with its losses in the first year being 60 million yen.

Consequently, Takata, only in his 20s, took over the company as its president, moving to a cheaper location where land rental fees dropped from 800,000 yen per month to 100,000 yen. For the next three years Nano-TEM was operated on a hand-to-mouth basis. In the second and third years, Takata was about to sell his company to Taiwanese companies. However, help came from a Kyoto Denki businessman in Taiwan. Although the help was not in monetary terms, he introduced Takata to potential clients in Taiwan and also to National Chiao Tung University¹⁰⁾. After five years of struggle, Takata was able to borrow money from a bank. The company raised its capital by 60 million yen with financial help from Tokyo Small and Medium Business Investment & Consultation Co., Ltd in 2003.

After such a dire situation, Nano-TEM's revenue fluctuated around 200-300 million yen per year; there are few ups and downs, but also no drastic peaks or troughs either. In March 2005, Tohoku Innovation Capital, a venture fund, subscribed

Nano-TEM's capital increase (100 million yen) and in September 2006 offered another 125 million yen. The fund is owned by Tohoku Electric and it tends to interfere with the management of Nano-TEM but Takata tries not to cede too much to its pressure.

Business Process

Nano-TEM produces grinding and precision machining tools. Its main revenue comes from porous ceramic based machine tool components that are a key element of the machine tool function. Porous ceramics vacuum chuck (named 'aeroFIX') forms a core part of the company's products. Takata insists Nano-TEM is not a processing shop (*Kakouya*) but a material shop (*Zairyouya*). Yet consultation and solutions (*monotsukuri*¹¹⁾) is the basis of its business. Customers who find trouble in processing, after visiting about 10 companies, reach out to Nano-TEM.

The flow of sales and delivery includes (1) product presentation, (2) consultation and discussions, (3) design, specs and estimate submission, (4) contract, (5) fabrication, (6) quality inspection, and (7) shipment. Typically, customers visit Nano-TEM and explain what they want, and based on this, Nano-TEM develops its "tools" (ceramic parts or components for larger equipment). President Takata also may travel to client's site. He believes "meet in person and see how it works" is the best way to deliver the product idea. The prototype development takes a maximum of two weeks. The lead time before the contract can be a question of only a couple of months. A lot may contain a couple of tens of units (each unit costing, for example, 200,000 yen). Nano-TEM also rents demonstration sample chuck (aeroFix) to confirm the outstanding performance of its product. Despite Takata's claim of *zairyouya*, we may agree that actually Nano-TEM is selling its competence to adapt to its client's requirement.

The Market

Nano-TEM receives five to six contacts every week through Internet contact forms or email. Customers learn about Nano-TEM through the company's product menu on the website, recommendations by friends, or information through international

product expositions. Takata feels that participating in product expositions in Japan is the most efficient marketing because directors of foreign companies who are in key decision-making roles come to Japan in search for advanced tools and technologies. Such people have an influential role in putting together new technologies into their existing production line. Additionally, they are open to appreciate and apply (use) their products quickly. In contrast, those attending fairs abroad tend to be low-level operators without decision-making powers.

Nano-TEM's current Japan and overseas market share are of equal size (as of 2015). The market was mostly overseas three years ago. China, South Korea and Taiwan are good markets for Nano-TEM. Its big buyers are Samsung, LG, etc. Contact is not because of personal relationship. Despite executives within these companies changing over time, they appreciate Nano-TEM's products, and keep coming back to Nano-TEM.

Management Philosophy

The firm's mission statement emphasizes people's happiness and new value creation. The firm's management ideals stress (1) their own technology, (2) scientific control/management, (3) new value-creation, (4) the co-prosperity with stakeholders. President Takata repeatedly says "Even if you think it is impossible, just do it as far as you can. The buyer will appreciate it." He does not cease to emphasize this to his employees and insists that they do not forget to sell "favors" to the clients because some day they will repay them.

Current Issues

Nano-TEM stopped selling "whetstones" since they became unprofitable. This was due to Japan's conservative commercial customs that fostered an atmosphere in which clients were able to get anything or any advice for nothing. However, Takata thinks that if they can re-enter this business, the company's revenues would see a drastic increase and its profitability would experience an astronomical improvement.

Another point Takata expects to improve is the *budomari*¹²⁾ to the level of 50-60. Up to now the *budomari* was somewhat mediocre (as low as 10) since Takata was too busy to pay due attention to

it.

Personnel

The firm has 19 employees on its payroll. Takata does not think that the academic training level leads to a better understanding of business. The best operator is a 31-year old, university drop-out. Such a person can capture Takata's explanation on the fly without needing many words. For Takata, employees referred to the company by acquaintances are more reliable.

Similarly, Takata does not think university lecturers could be good collaborators with his company. As a matter of fact, he has never consulted them on a technological issue. Takata is convinced that an engineer who can elaborate a business plan with the entire perspective of the entire business process is the person who actually understands the business. In other words, those who cannot write a business plan cannot understand the business. Takata maintains the book-keeping by himself. He spent his formative years learning accounting concepts and business management especially the amoeba management of Kazuo Inamori (Kyocera founder) and has been keenly practicing it in Nano-TEM. He tends to take up the consultation from their clients and achieves solutions himself, passing them on to his staff later. He wants to be called "*Adventure*" instead of "*Venture*". Sleeping less than 2-3 hours a day became his custom. The personal conviction of the need to survive, the "*fire in the belly*" in his words, has driven his company's success.

Japanese clients versus foreign clients

As discussed in the previous section, the machine tool market is a multi-tiered market, matched by a multi-tiered production system dominated by long-established players. Japanese manufacturing firms are generally conservative and rely on both a machine tool builder's reputation and past relationships to conclude purchasing agreements. In the early years of Nano-TEM, Takata tried to introduce his new products to Japan machine tool makers as well as manufacturing firms. Being a technology-oriented startup in a niche market, Nano-TEM faced serious challenges due to rigid Japanese corporate culture and an absence of a backing mega

company. Japanese companies would take years to take his products into consideration. They tend not to take any risk by adopting new devices. In contrast, foreign clients such as Samsung and LG from South Korea are more daring. Korean clients approach Nano-TEM through their vendors who sell machinery and equipment to them. Nano-TEM's products are purchased through these vendors though the final user may pressure the vendors to consult with and buy from Nano-TEM. As its superior features have been seen over time, Nano-TEM products have gradually become accepted by Japanese firms. Until three years ago, Nano-TEM's market was mostly overseas. As of 2015, however, the size of their domestic market and that of their international market had become almost the same.

DISCUSSION

At the beginning of this paper we formulated two hypotheses. Now we are in a position to answer them one by one and draw some generalizable conclusions.

H1: Entrepreneurs with profound knowledge of fundamental accounting concepts have higher potential to be successful.

When engineers and researchers create a startup business, there is a tendency of "technology first, management after." Nano-TEM is not an exception. As stated earlier, it started with 10 million yen capital but ambitious investment in building and equipment bled the company gravely. Takata presumed the position of president and carried out various actions including moving the factory to a place which required less rent, strengthened its innovative product portfolio, and prepared reliable financial reports and estimates essential for obtaining outside financing. In addition to porous vacuum chuck, Nano-TEM diversified its product offering covering all four areas of machining – namely Grinding, Lapping, Polishing and Dicing, each of which was built around its porous ceramics sintering technology. Such product diversification helped Nano-TEM to improve its cash-flow, for instance, porous whetstone 'through-feed grinder' drove decent cash flow in the early 2000s.

Without Takata's level of business management,

especially in accounting and financial control, Nano-TEM would have gone out of business in its early stages. To date, Takata is maintaining the company's book-keeping himself. That fact exemplifies the level of direct involvement he has had over the course of the company's existence.

H2: Overconfidence plays an essential role for entrepreneurs to start a venture business especially in the context of the Japanese economy.

The decision not to keep business development personnel within a company is unique for a manufacturing company. It is the founder's belief that the products offered by the company are unique and have clearly superior features thus the business development person could not help much in its sales of its products – specifically in delivering a clear message about their principal usefulness and reliability. People who have actual problems would visit Nano-TEM and arrive at a solution collaboratively. The clients' requests are unique and challenging. President Takata is the person who would tackle the challenge and create the solution.

Takata shows strong belief in himself that he has ability 1) to tackle ever increasing tough demands, 2) to run a business without needing any extra business development personnel and 3) to deliver and lead his firm with clear management philosophy and value creation mindset. His controversial view about the impact of the academic training level on one's understanding of business is notable. The same is true for his impression of university lecturers as collaborators not being very useful for his company's business, despite being a university venture. These facts amplify his level of confidence in his area of business. To some extent, his mentality can be characterized as overconfidence. However, as discussed at the beginning of this paper, for Japanese individuals stereotypically having cautious and prudent characteristics, overconfidence can be an essential element to become a successful startup and to survive in the machine tool business.

Being in the industrial capital goods market, the strong culture of the buyer-seller interdependence is a challenge for a niche business like Nano-TEM. Manufacturing firms rely on both a machine tool builder's reputation and past relationships (JMTBA,

1989). They tend to buy products from suppliers who ensure availability of replacement parts over an extended period of time and maintain compatibility with tools already in place. These firms also seek suppliers who can respond to their needs effectively in a short time without detailed contractual agreements. Such requirements could be too costly for small business like Nano-TEM. His strong belief in his ability to achieve a solution as well as his belief in his products as the best in the class are additional strengths. The business owner's confidence of his products' capability and his enthusiasm delivered a strong message to customers. In this sense, overconfidence itself can be characterized as a key entrepreneurial skill and a must-have for entrepreneurs of Japan in particular.

CONCLUSION

We may summarize that Nano-TEM is an experience-based business. The firm is an entity created in the image of its president. Its values are those of its president. The founder-president's way of strategizing is more inductive, though he, as a PhD, tries to "*theorize*" his observations. Knowledge is acquired intuitively and tacit knowledge component defines its nature (Kase, Slocum, & Zhang, 2011).

Another lesson we can learn from this case is that a start-up business cannot continue unless its founder has a strong need to sustain it over a long period. Personal conviction, the need to survive, the "*fire in the belly*" are all found in President Takata. Can it be replicated? In this regard, competitors would have hard time if they want to imitate this perhaps of a high level of the tacit knowledge portion involved in the business. Yet for Nano-TEM '*Continuity without him*' is another question.

NOTES

- 1) We express our profound gratitude to Mr. Asushi Takata, the President of Nano-TEM Company Limited for a lengthy and detailed interview held on April 22, 2015 for the collection of data and his views on venture business.
- 2) IMD World Competitiveness Yearbook 2012 <http://www.imd.org/news/IMD-announces-its->

- 2012-World-Competitiveness-Rankings.cfm
- 3) the economic policies advocated by the Prime Minister of Japan, Shinzo Abe.
- 4) the ratio of the number of new entrants to the number of existing firms (or establishments)
- 5) the ratio of the number of exits that cease operations to the number of existing firms (or establishments).
- 6) A keiretsu is a type of informal business group or a set of companies with interlocking business relationships and shareholdings.
- 7) <http://www.systemseiko.co.jp/index.html>
- 8) Nano-TEM four factor material services; http://nano-tem.com/contents/technology_system_e.html (Access on Dec 5th 2015)
- 9) http://nano-tem.com/contents/company_gaiyo.html
- 10) National Chiao Tung University (台灣交通大學). <http://www.nctu.edu.tw/index.php/en>
- 11) *Monozukuri* means 'making things'. It emphasizes a unique Japanese manufacturing style.
- 12) *Budomari* (歩留まり) is a Japanese manufacturing term. It stands for the good part of the yield as opposed to *furyo* (不良), the bad part.

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