

Legacy of Meister Namihei Odaira

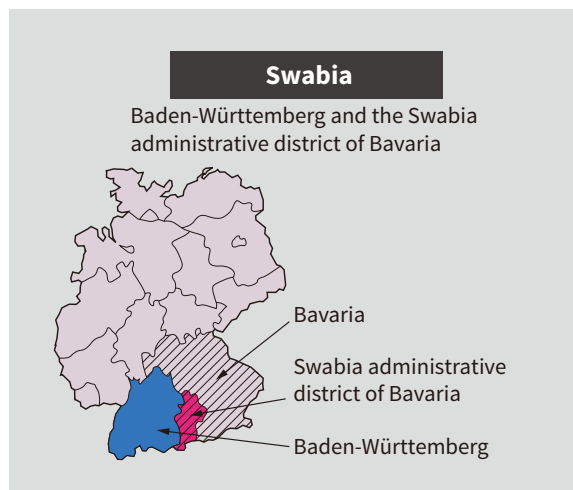
Age of Meister

Hermann Hesse's Nostalgia

Craftspeople feature prominently in the works of author Hermann Hesse, examples of which include "Peter Camenzind" and "Unterm Rad" (Beneath the Wheel). Hesse was born in 1877 in the town of Calw, part of Swabia in what is now the German state of Baden-Württemberg (BW) [1]. The region is home to many *Mittelstand* companies, the small and medium-sized enterprises that are a legacy of the era when "Meister" (master craftspeople) dominated industry, and is a manufacturing heartland that gave rise to such entrepreneurs as Gottlieb Daimler and Robert Bosch. BW continues to lead other parts of Germany in terms of the number of patents awarded, and is the location of the headquarters for SAP SE and large manufacturers such as the industrial machine company Trumpf GmbH.

Zünfte (guilds of manual *Meister*) were first established in Germany around the time of the 12th and 13th century. *Zünfte* held a philosophy of manufacturing based on Christian ethics, believing that the spirit of the craftsman imbued his products with a soul, with *Meister* having obligations that included training apprentices, passing on their skills, and maintaining rigorous control over quality. Furthermore, the number of guildsmen with the status of *Meister* was restricted, and those who had not attained this rank traveled from place to place. Subsequently, to have been one of these journeymen was a prerequisite for becoming a *Meister*.

[1] Swabia



At the time of Hesse's birth, the Industrial Revolution had already reached Germany. His works are full of nostalgia for the crafts that had been overtaken by these revolutionary changes. In practice, however, the *Meister* adopted new technologies and expanded their activities beyond manual workshops and into the factories. Ferdinand von Steinbeis, who at the time had responsibility for trade and commerce in the Kingdom of Württemberg, came up with a dual education system whereby apprentices continue to study at school while also working, this being a way to foster the right sort of skills for the Industrial Revolution.

Nowadays, "Meister" (master craftsman) is a nationally recognized qualification in Germany. *Meister* require the teaching skills to foster their successors, the technical skills to maintain quality, the commercial know-how to grow their business, and the development capabilities to come up with new products.

The Journey and Business Creation of Namihei Odaira

Hitachi's founder Namihei Odaira was born three years before Hesse, in 1874. After graduating from Tokyo Imperial University, he went on to work at Kosaka mine, the Hiroshima Hydroelectric Power Company, Tokyo Electric Light Company, and, in 1906, at Hitachi mine.

Based on his motto that companies are their people, Odaira placed a particular emphasis on engineer training and offered exceptional conditions to attract a team of elite engineers who had graduated from imperial universities, Naosaburo Takao and Kumeo Baba among them. Apprenticeship Training School was established in 1910 at the same time as Hitachi was founded as a company [2]. The facility operated as a boarding school with the company supplying meals and clothing. It emphasized intellectual, physical, and moral instruction,

[2] Class at Apprentice Training School (around 1917)



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[3] Words of Naosaburo Takao Posted in Manufacturing Workplace



Narashino Division of Hitachi Industrial Equipment Systems Co., Ltd.

with Kumeo Baba having primary responsibility for practical training.

Chikara Kurata and Daigoro Yasukawa were among those who joined the company in 1912. Kurata would go on to succeed Namihei Odaira as Hitachi's second president. Yasukawa, in turn, after first traveling to America to undertake an apprenticeship at Westinghouse, established a company to manufacture electrical machinery for mines. Yasukawa Electric Corporation went on to become one of the world's leading producers of robots and machine tools.

Hitachi the company split off from Hitachi mine in 1920 and incorporated as a joint-stock company. The following year saw the establishment of Hitachi Koshu School (with Baba as headmaster) to provide further education in engineering beyond that offered by the apprentice training school, which by this point had an enrollment of more than 300 students. The new school operated on Hitachi's version of the dual education system, with students working in the factory during the day and taking classes in the evening.

After various changes, the apprentice training and engineering schools went on to become the Hitachi Technical High School. As skills shortages were a feature of this period of emerging Japanese industry, students of Hitachi Technical High School who had undergone hands-on training were much sought-after by other companies. While this led to the loss of a number of graduates to rivals, Odaira was unconcerned by this, recognizing how it was helping to build Japan's industrial capabilities.

This was also the year when Sadahiko Onishi joined the company. Onishi would later become executive vice president in charge of the industrial equipment business. He had a practice of gathering young engineers together to participate in study groups called "*Kakuchi-kai*," an abbreviation of the *Kakubutsu Chichi* concept of acquiring knowledge through investigation that derives from the classic texts of Confucianism. Kumeo Baba, the head of engineering at the company would join these weekly meetings among young engineers as a regular participant. The passion for manufacturing felt by Namihei Odaira and the other founding staff is reminiscent of that of the guild *Meister*. The words of Naosaburo Takao, "*Rivet your soul into your works*," are still to be found posted at many of Hitachi's manufacturing workplaces [3].

Restoring Earning Power

Agenda 2010 and Industrie 4.0

At the same time as Odaira was setting about establishing the company, Johannes Hesse, the father of Hermann, published a German translation of Kanzo Uchimura's book "*Representative Men of Japan*." Yozan Uesugi, one of the men chosen in the book as being representative of his nation, restored the down-trodden feudal clans, restraining leading figures in the conservative faction and pursuing reforms that encouraged the highly lucrative silk industry.

Germany, now talked about as the star of the European Union (EU), was in the 1990s called the "sick man of Europe" after suffering a major economic setback with its integration of East Germany. However, a set of policies aimed at restoring the nation's fortunes called Agenda 2010 were introduced by Chancellor Gerhard Schröder of the Social Democratic Party (SPD).

The SPD started out as a workers' association founded by Ferdinand Lassalle, at one time a friend of Karl Marx. The party traditionally gathers its support from factory *Meister* and other craftspeople. Craftspeople who traveled from country to country played a part in the spread of Marxism in the late 19th century. Otto von Bismarck, known as the "Iron Chancellor," countered this movement by introducing generous social security policies for these and other workers.

Agenda 2010 made changes to the social security measures that had been in place since Bismarck and delivered a turnaround in economic performance through measures that

included cutting benefits for the long-term unemployed and boosting job placement services. As this was accompanied by increasing inequality, with a rise in the number of people in low-income roles such as “mini-jobs,” it provoked a backlash from SPD supporters and Chancellor Schröder was forced out of politics before completing his term of office.

The growth strategy for manufacturing adopted by Chancellor Angela Merkel of the Christian Democrats (CDU), who took over government from the SPD, was called “Industrie 4.0.”

The two people charged with promoting Industrie 4.0 were Henning Kagermann, formerly CEO of SAP and chair of the National Academy of Science and Engineering (acatech), and Siegfried Dais, a former vice president at Robert Bosch. The pair jointly chaired the Industrie 4.0 working group, which had five subcommittees on topics such as smart factories and people and work. It published a report entitled “Recommendations for Implementing the Strategic Initiative Industrie 4.0” in 2013.

At the heart of German manufacturing are the *Mittelstand* companies that are defined as those with up to 500 employees and sales of up to 50 million euros. These companies are typically not listed on the stock exchange and are family-run with a long-term outlook, achieving a high return on assets (ROA). Many of the companies are what have been called “hidden champions,” focusing on high-quality niche markets where they enjoy a high global market share. There are also companies such as Steinbeis Transfer GmbH of BW, which traces its origins back to von Steinbeis, that are actively engaged in supplying the latest technology to *Mittelstand* companies.

Despite this, there is a strong sense of crisis pervading German manufacturing brought on by the rapid advance of digital technologies in recent years and competition from low-cost emerging nations. Having the practices of Industrie 4.0 adopted by the *Mittelstand* is one of the challenges.

The digitalization of manufacturing has become a hot topic internationally since the announcement of Industrie 4.0. Unfortunately, as is often the case when buzzwords like this catch hold, there are signs of the means being confused for the ends, with companies feeling they need to embrace digitalization mainly because they see their competitors doing the same. It is important that investment in digitalization be done on the basis of clear objectives.

Japan's Earning Power

Japan since the 1990s has been described by some as going through three lost decades, with recent years having also seen an increasing focus on management practices that prioritize investment efficiency in a bid to restore corporate earning power.

In 2005, the EU introduced a requirement for listed companies to comply with the International Financial Reporting Standards (IFRS) that put an emphasis on balance sheets. The Ito Review was the final report, published in 2014, of a project by Japan's Ministry of Economy, Trade and Industry, its full title being: “Competitiveness and Incentives for Sustainable Growth: Building Favorable Relationships between Companies and Investors.” The report identified the short-term thinking of Japanese companies as an impediment to sustainable growth and recommended that attention be given to cost of capital and return on equity (ROE) along with the routine use of ROE indicators to boost motivation with the aim of achieving medium to long-term improvements in this measure of performance.

A cabinet decision entitled “Investment for the Future Strategy 2017: Reform for Achieving Society 5.0” was passed in 2017 and the government set a target of lifting the ROA of the top 500 companies in the Tokyo Stock Price Index (TOPIX 500) to a level that compares favorably with European and American companies by 2025.

Along with ROE and ROA, another indicator that sheds light on business performance is the return on invested capital (ROIC). Professor Michael Porter, a leading authority on management strategy, sees ROIC as the most appropriate indicator to utilize when formulating strategy.

In terms of improving workplace motivation, routine use of a tool called the “ROIC tree” provides an awareness as to which specific drivers are associated with improvements in workplace productivity (things like improvements in per-worker output, inventory reduction, and efficient use of equipment). The ROIC tree provides a way to break down the elements that make up ROIC, to gain an awareness of the company's value drivers right down to the workplace, and to implement improvement actions [4]. By doing so, it is possible, in the case of a manufacturing workplace, for example, to bring together workplaces that want to enhance their production skills with the management desire to increase earning capacity. As trade-offs between different drivers also exist, management needs to keep in mind which drivers it is seeking to improve.

Meanwhile, the method proposed by Professor Porter is that of the value chain. This is sometimes confused with the similar sounding term “supply chain.” However, whereas a supply chain refers to the flow of goods in the manufacturing industry from supplier to manufacturer to distributor, the value chain is not limited to manufacturing, and provides a way to identify the sources of value in a company's activities and determine how these relate to other activities. Professor Porter uses the term “value system” to indicate interoperation with the entire supply chain as exemplified by the use

[4] Management Indicator Formulae and ROIC Tree

(1) Formulae for management indicators

Each of these indicators can be improved by making efficient use of business assets

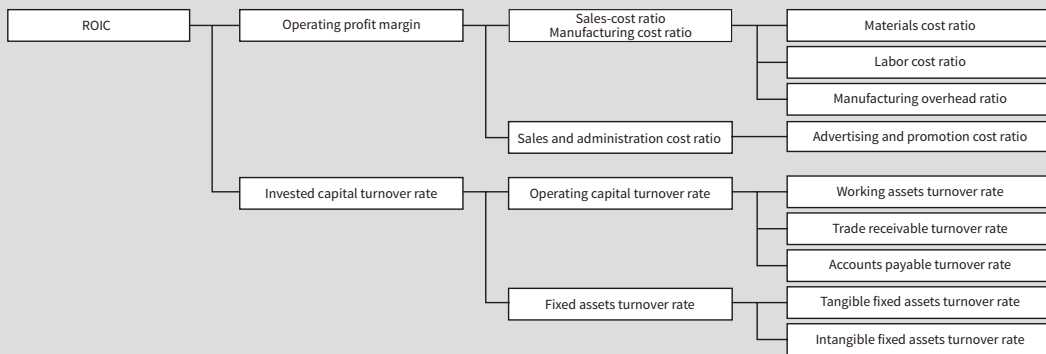
Return on assets (ROA) = Net income for period/Total assets × 100

Return on equity (ROE) = Net income for period/Equity × 100

Return on invested capital (ROIC) = Net operating profit after tax (NOPAT)/Invested capital × 100

(2) Sample ROIC tree

As ROIC is not a formal accounting indicator, the ROIC tree can be broken down in whatever way best facilitates analysis of the company's value drivers



Source: Prepared based on KPMG Insight, Vol. 22, January 2017

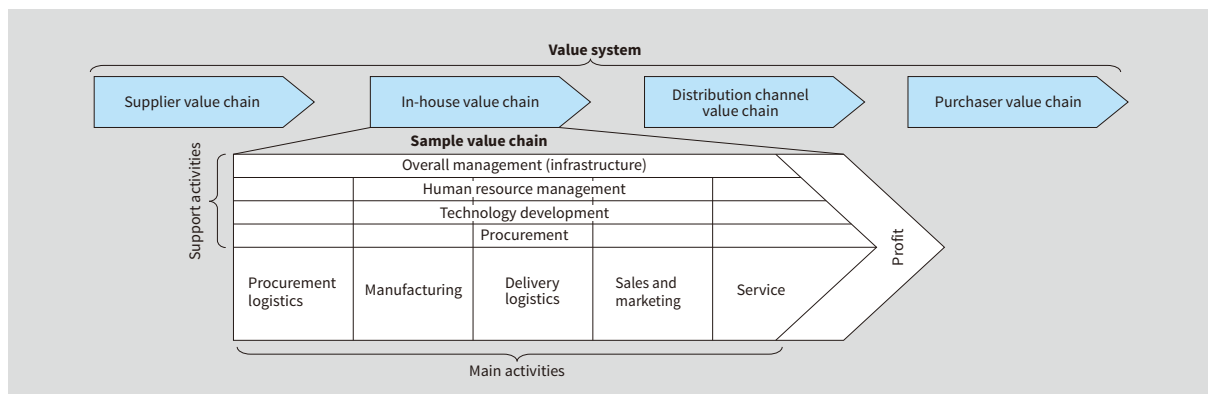
of just-in-time (JIT) production practices to reduce inventory levels [5].

Professor Porter has identified the key strategic elements of competitive advantage as being: (1) differentiation, (2) cost leadership, and (3) consolidation. Differentiation involves the supply of products and services with high added value that competitors find difficult to imitate, while cost leadership, too, means supplying products and services at low cost in ways that competitors cannot copy. Consolidation means focusing on particular products, customers, or regions and delivers a high return on finite management resources. By focusing on niche markets, the "hidden champion" *Mittelstand* companies can earn good profits even when manufacturing

in high-wage Germany. In other words, they have adopted a strategy that combines differentiation and consolidation. Moreover, Professor Porter makes the point that the key to a strategy that is difficult for competitors to steal lies in building a value chain that they will find difficult to replicate.

However, while the ROIC tree and value chain techniques are good at identifying the sources of value in a company, when it comes to value sources that are difficult for competitors to copy, it is not an easy matter to determine the links between individual activities and the overall situation, even within one's own company. One good way to shed light on such matters is to utilize the data collected by plant networks. Digital technology is also good at enhancing the value sources

[5] Value System and Value Chain



Note: Prepared based on "Competitive Advantage" and "The Competitive Strategy I" by Michael Porter.

highlighted. This is what makes the digitalization of manufacturing so important.

Combining Wellsprings of Strength: Linking Japan and Germany, People and Machines

The protagonist of Hesse's "Beneath the Wheel" suffers from a mental illness and gives up further education to become a machining apprentice, in doing so discovering the joy of making things. Likewise, the protagonist of "Peter Camenzind" finds healing in caring for a physically disabled person. What these stories are about is a search for appropriate relationships between people and between people and machines.

Japan and Germany are currently working together from the same perspective. A joint project by Japan and Germany to work together on the Internet of Things (IoT) was launched to coincide with a 2015 summit meeting between the two nations where an agreement was reached to cooperate on Industrie 4.0 and other areas. Hitachi has embarked on joint work with research institutions in Germany under this framework. A joint project with Professor Kagermann was initiated in 2018 targeting the Sustainable Development Goals (SDGs). The project was led by Professor Kagermann with Yoichi Nonaka, Senior Chief Researcher at Hitachi's Research & Development Group, as the co-leader. The participants were from German and Japanese industry, government, and academia, including acatech, SAP, Hitachi, and the University of Tokyo.

Both countries are currently facing problems such as shortages of experienced staff and an aging workforce, with worker diversity also an issue. A white paper, produced in the fall of 2019 by this project on "Revitalizing Human-Machine Interaction for the Advancement of Society" used the example of autistic staff in an active employment initiative at SAP India. The white paper noted that the abilities of autistic staff to concentrate and use abstract thought have made a large contribution to software development. While further investment is needed in diversity measures like this, SAP earned a comparatively quick return and the benefits went beyond the company to be spread across society, including social security savings and fostering a sense of social inclusiveness.

The white paper also discussed the Multiverse Barrier Free program being promoted by Hitachi as a means by which a wide variety of people and machines can assist one another. At the same time as the manufacturing workforce is becoming increasingly diverse in terms of experience and age as well as gender and ethnicity, there is growing diversity among machines also, from traditional lathes to the latest robots. The white paper described Multiverse Mediation, a method for mutual assistance between humans and machines to create

manufacturing workplaces where everyone finds it easy to work and grow, giving examples of flexible production systems that optimize overall operation by enabling a wide variety of people and machines to complement each other's strengths and weaknesses.

Workers fearful of losing their jobs to machines formed the Luddite movement in the early 19th century during Britain's Industrial Revolution. The movement destroyed a large number of machines. In Germany, the Industrial Revolution did not arrive until somewhat later and *Meister* actively adopted the new technologies. While a high level of concern about loss of jobs to artificial intelligence (AI) or robots exists in the present day, the digital transformation is all but inevitable. This makes it desirable that we should push ahead with Multiverse Mediation and create a better quality of employment [6].

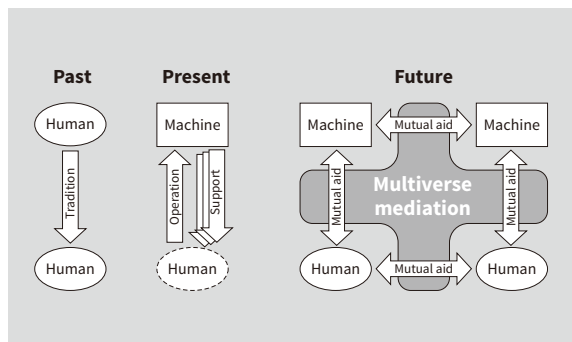
What makes possible this pursuit of social value through collaboration between Germany and Japan is the two nations' shared manufacturing philosophy of makers putting their souls into the things they make.

An Asset Bequeathed by Odaira

Hitachi Technical High School is currently certified by the Ministry of Education, Culture, Sports, Science and Technology as an advanced vocational school and still holds to the manufacturing ethos that inspired its founding. The school is able to offer high school qualifications and operates on a boarding model, with both boarding and tuition, in principle, still being free. Practical training is supervised by graduates of the school who have participated in the National Skills Competition, with 34 of the 90 graduates from the 2018 academic year obtaining gold (the highest ranking for Junior *Meister*). The final half-year prior to graduation operates under Hitachi's version of the dual education system, with students able to hone their practical skills through programs such as on-the-job training at the Hitachi manufacturing plant where they plan to work after graduating.

Efforts have also been made to improve the managerial, technical, development, and educational skills that the *Meister* need, including Chikara Kurata, Hitachi's second president, marking the 50th anniversary of the company's founding by opening the Hitachi Technical College (now known as Hitachi Academy's technical training program) in 1960. This was followed a year later by the opening of the Hitachi Institute of Management Development in 1961 to train management staff. The Institute of Management Development and training facilities for mid-level technical staff in things like IT and operational technology (OT) were combined as Hitachi Academy Co., Ltd.

[6] Changes over Time in Interaction between Humans and Machines



Note: Prepared based on Revitalizing Human-Machine Interaction for the Advancement of Society.

in April 2019 to provide the foundations for human resource development alongside Hitachi Technical High School and Hitachi Technical College.

Staff self-improvement also continues in new forms. A global youth study group was set up by young staff in 2006. While the name of the group is more straightforward than the *Kakuchi-kai*, it embodies the same spirit of improvement. It has since been renamed "Team Sunrise" and now has more than 1,500 members. Although it continues to function as a voluntary study group, the scope of its activities has expanded more widely, including holding an ideathon on the topic of temperature-sensing inks in February 2019 through collaborative creation with Hitachi's Research & Development Group and Hitachi Industrial Equipment Systems Co., Ltd.

Hitachi Industrial Equipment Systems is the company that has taken responsibility for the machinery business first led by Sadahiko Onishi. The company operates globally in markets such as marking, air compressors, and IoT products. Sullair, LLC, another company that manufactures and sells air compressors, joined Hitachi Group in 2018 and JR Automation Technologies, LLC, a robotics system integrator affiliated with Hitachi in 2019. Through the technologies and other resources of new affiliates and the synergies of Lumada, Hitachi intends to strengthen its solutions that link things like cross-industry arrangements by providing the venues for bringing things together through open innovation, whether it be vertical in the case of workplace and management (edges) or horizontal in the case of companies (tasks that form part of the supply chain).

When Naosaburo Takao once suggested to Namihei Odaira that he be given a memorial, Odaira replied that Hitachi was his work and his legacy. He did not need anything else.

The asset bequeathed by Odaira spans time and space.

* Junior Meister: A system whereby the National Association of Technical High School Principals recognizes pupils of technical high schools who have gained national qualifications or other achievements.

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