Knowledge Management Practices at Toyota Motors

This case was written by N. Ruchi Chaturvedi, under the direction of Sanjib Dutta, IBS Center for Management Research. It was compiled from published sources, and is intended to be used as a basis for class discussion rather than to illustrate either effective or ineffective handling of a management situation.
Knowledge Management Practices at Toyota Motors

“Toyota does not have a separate Knowledge Management philosophy and strategy; managing and sharing knowledge are a part of everyday life at Toyota.”

- Rory Chase (Chase), Managing Director, Teleos.¹

“I believe Toyota has raised continuous improvement and employee involvement to a unique level, creating one of the few examples of a genuine learning enterprise in human history - not a small accomplishment.”

- Jeffrey K. Liker (Liker), Director, Japan Technology Management Program, University of Michigan.²

KNOWLEDGE AS POWER

In 2004 Toyota Motor Corporation (Toyota) was Japan’s largest company and the world’s second largest automobile company with worldwide unit sales of 6.7 million.³ It was recognized as one of the world’s best knowledge enterprises, and was a three-time winner of the Global Most Admired Knowledge Enterprises (MAKE) Survey, and a five-time winner of the MAKE Japan Survey. This award recognizes best practices in the area of Knowledge Management. The survey studied enterprises on criteria like knowledge-based culture and products; knowledge sharing and collaboration; as well as organizational learning (Refer Exhibit I for details of the performance dimensions).

Most experts believed that successful Knowledge Management (KM) had given Toyota a keen competitive edge. Toyota’s Production System (TPS) manufactured a variety of high-quality vehicles at very low cost. Toyota had been extremely open about its TPS. Company sources were quoted to have said, “Study us all you want”. Still no other company was able to match Toyota’s production system despite decades of effort. The world’s largest automaker, General Motors (GM), entered into an alliance with Toyota to see its production systems in action and learn the intricacies, but could not match Toyota standards. According to a study⁶, DaimlerChrysler, one of the “Big Three” auto firms, acknowledged that its KM initiatives had been actually inspired by Toyota’s Yokoten system.

¹ Teleos is an independent Knowledge Management research company based in the United Kingdom. It conducts the MAKE Survey in association with the KNOW network since 1998. The Survey identifies Top 20 enterprises in the area of Knowledge Management.
³ General Motors (GM) is the biggest automobile company in the world in terms of unit sales. GM’s unit sales for the year 2004 were 8.2 million.
⁴ The MAKE Survey is conducted by The KNOW Network which is a global community of knowledge-driven organizations dedicated to sharing best Knowledge Management practices.
⁷ The term Big Three refers to the three big US automobile companies - GM, Ford and DaimlerChrysler.
⁸ A fundamental principle of the Toyota Way, it refers to sharing of information and ideas.
Toyota’s KM practices were considered unique because KM was embedded in its culture, unlike at most other enterprises where it was implemented as a separate and independent effort. The company’s most visible knowledge management initiatives included the establishment of the Toyota University, the Toyota Institute, the Global Production Centre (GPC) and the Toyota Global Knowledge Centre. Toyota’s management philosophy based on “The Toyota Way” was documented in 2001 in an effort to make KM more explicit. Toyota’s KM approach had also been acclaimed for its focus on continuous learning with Kaizen and its employee suggestion system that received approximately one million ideas a year out of which about 90% were successfully implemented.

BACKGROUND NOTE

Toyota was set up in 1897, when Sakichi Toyoda (Sakichi) diversified into the handloom machinery business from his family’s traditional business of carpentry. He founded Toyoda Automatic Loom Works (TALW) in 1926 for manufacturing automatic looms. Sakichi invented a loom that stopped automatically when any of the threads snapped. This concept of designing equipment to stop so that defects could be fixed immediately formed the basis of the Toyota Production System (TPS) that went on to become a major factor in the company’s success.

In 1933, Sakichi established an automobile department within TALW and the first passenger car prototype was developed in 1935. After this the production of Model AA began and Toyota Motor Corporation was established in 1937. Kiichiro visited the Ford Motor Company in Detroit to study the US automotive industry. He saw that an average US worker’s production was nine times that of a Japanese worker. He realized that the productivity of the Japanese automobile industry had to be increased if it were to compete globally. Back in Japan, he customized the Ford production system to suit the Japanese market. He also devised a system wherein each process in the assembly line of production would produce only the number of parts needed at the next step on the production line, which made logistics management easier as material was procured as per the need. This system was referred to as Just-in-Time (JIT) within the Toyota Group.

JIT production was defined as ‘producing only necessary units in a necessary quantity at a necessary time resulting in decreased excess inventories and excess workforce, thereby increasing productivity.’ Kiichiro realized that relying solely on the central planning approach would not be feasible, and would make it very difficult to implement JIT in all the production processes for an automobile. Hence, TPS followed the production flow conversely. People working in one process went to the preceding one to withdraw the necessary units in the necessary quantities at the necessary time. This resulted in the preceding process producing only quantities of units to replace those that had been withdrawn.

Toyota flourished during the Second World War, selling trucks and buses to the army. The company launched its first small car (SA Model) in 1947. After the war, the company faced a series of financial problems. A financial support package from a consortium of banks (after the intervention of the Bank of Japan) helped Toyota tide over its problems. The package consisted of a series of steps that included downsizing and restructuring the company into separate manufacturing and sales divisions. As per the revival package, The Toyota Motor Sales Company Ltd. was formed in 1950. In the same year, Kiichiro resigned.

By 1952, Toyota made a turnaround and in 1953, the company appointed distributors in El Salvador and Saudi Arabia and started exports. Meanwhile, Taiichi Ohno (Ohno) took charge of the company. In 1957, Toyota entered the US market through its subsidiary, Toyota Motor Sales, USA. In 1959, the company began its first overseas production in Brazil and over the next few years, developed a vast network of overseas plants. Besides manufacturing, Toyota started a global network of design and Research and Development facilities, covering the three major car markets of Japan, North America and Europe.
By the early 1970s, Toyota’s sales were more than the sales of Chrysler and Volkswagen and in terms of production only General Motors (GM) and Ford were ahead. Toyota continued its efforts to make its production system more efficient and developed flexible manufacturing systems. It also began to tap the markets in the Middle East, and by 1974 the Toyota Corolla, launched in 1965, became the largest selling car in the world. In 1983, the company ventured into financial services with the establishment of Toyota Financial Services. In 1984, Toyota and GM entered into a joint venture and established the New United Motor Manufacturing Inc. (NUMMI).

By the early 1990s, as Toyota expanded its overseas operations, the excessive capital spending affected its profit margins. Tatsuro Toyoda (Tatsuro), who took over as the company president in 1992, began to control costs by eliminating all unnecessary expenditure. In 1995, after Tatsuro resigned due to health reasons, Hiroshi Okuda (Okuda) became Toyota president. In 1996, Toyota consolidated its production in North American production units into the Cincinnati-based Toyota Motor Manufacturing (North America).

In 1999, Okuda took over from Shoichiro Toyoda as Chairman, while Fujio Cho (Cho) became the president. In the same year, Toyota listed its shares on both the New York and London stock exchanges. By the end of 2001, the company’s net income reached $5,447 million and net revenue reached $106,030 million. Toyota’s main business now encompassed design, manufacturing and sale of passenger cars, recreational vehicles, sport utility vehicles, minivans, trucks, buses and related parts. In 2004, Toyota had around 554 consolidated subsidiaries and 228 affiliates. (Refer Exhibit II for details of the organization).

**KNOWLEDGE MANAGEMENT AT TOYOTA**

According to analysts, Toyota’s success in both the local and global markets was based on its gaining a competitive advantage through implementation of innovative and path-breaking ideas on its production floors. TPS worked on the basic idea of maintaining a continuous flow of products in factories in order to adapt flexibly to changes in demand. TPS linked all production activities to real dealer demand through implementation of Kanban, JIT and other quality measures.

Toyota had focused on learning from the very beginning. Using organizational learning as a means, Toyota actually re-designed the process of automobile manufacturing by introducing the JIT manufacturing system. Toyota had been practicing knowledge management as part of its everyday life, but a striking manifestation of it was seen in a crisis that disrupted Toyota’s operations in 1997. A fire broke out at Aisin Saiki, which was the sole supplier of proportioning valves9 (P-valves) for Toyota vehicles. Since Toyota was following the JIT system, it had little reserve stock. Huge losses for Toyota and Aisin became imminent as assembly lines had to be shut down. To overcome the situation, Aisin contacted other manufacturers of P-valves. But the problem was that none of the suppliers had the capability to make P-valves as per Toyota’s specifications. Aisin faxed the design for the valves to suppliers, and with little direct help of Aisin or Toyota, more than 200 companies reorganized themselves to develop six different production processes, test these hands-on, share their failures and successfully manufacture P-valves. Toyota recovered from the crisis within three days and regained the original level of production within a week. This amazing result intrigued researchers, and many studied Toyota’s Supply Chain Network to find out how competing suppliers could collaborate with each other to avert a huge crisis for Toyota. Researchers concluded that the success of this lay in Toyota’s “decentralized knowledge management” practices.

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9 Proportioning valve is a small but high precision brake-related part used in almost all Toyota vehicles.
Enterprise Wide Knowledge Sharing & Collaboration

At Toyota, knowledge sharing was intertwined with its people-based enterprise culture, referred to as the Toyota Way. The five key principles that summed up the Toyota Way were: Challenge\(^{10}\), Kaizen (improvement), Genchi Genbutsu (go and see), Respect and Teamwork. The Toyota Way recognized employees as the company’s strength and attached great importance to developing human abilities through training, coaching and mentoring. The principles of “Respect for People” and “Continuous Improvement” were at the core of the Toyota Way. In 2001, the company released a document called “The Toyota Way 2001” to give its guiding principles a concrete shape so that they could be imbibed by its employees across the globe and carried further in the future. Toyota emphasized conversion of tacit knowledge into enterprise knowledge with due importance to human relationships. It encouraged employees to generate ideas and help in the company’s evolution.

Toyota held an annual event called the Idea Expo since 1976. The Toyota Engineering Society\(^{11}\) (TES) organized the event for which the catchline said, “Overcoming Challenges, Realizing Dreams.” The main contest was called the “vehicle of the future contest.” According to the company, the event emphasized the personal approach to making things (Monozukuri) and promoted hands-on experience (Genchi Genbutsu). Participants usually worked on projects after their working hours for a period of two and a half months. The vehicles manufactured were judged on their concepts, technology and potential for commercialization. The idea was to let people turn a concept into a working vehicle. According to the company, the Expo carried forward the spirit of the TPS, and was designed to stimulate problem solving through hands-on experience. This was the reason why some people expanded TPS to stand for Thinking Production System.

Most experts agree that the TPS system at Toyota worked by combining its explicit\(^{12}\), implicit\(^{13}\) and tacit\(^{14}\) knowledge. Toyota trained new employees by bringing them to an existing facility where they worked alongside the highly trained managers. Once the training was over, this group of workers was joined by an extremely skilled old worker group and as operations began at the new factory, it was ensured that all technical knowledge was passed on to workers at the new plant. Toyota’s total knowledge base incorporated the knowledge flow in its processes and routines, as well as in the interactions between its workers, suppliers, and managers. Experts identified Toyota’s knowledge-driven work culture as a major contributor to Toyota’s success. They cited this as the reason behind the establishment of a new division-Saturn, by GM. With this division, GM hoped to imbibe the culture of a knowledge-driven system in a fresh way, so as to benefit from the TPS system created at NUMMI.

The use of quality circles at Toyota also illustrated a combined implicit and explicit approach. Toyota workers spent one or two hours at the end of each week, analyzing the performance of their part of the production system, to identify actual or potential problems in quality or productivity. During these quality circle meetings, employees proposed measures to solve identified problems and discuss the results of the measures taken during the week to address earlier problems. This practice led to processes being refined on a continuous basis, leading to fewer errors at a later point. The suggestions received from the quality circles were scrutinized by Toyota production

\(^{10}\) The Challenge principle gives the employees a long-term, realistic and stretching vision for the company that will add real value to the business. It prevents the company from becoming complacent even in the best of times. It continuously challenges itself to keep the spirit of Kaizen.

\(^{11}\) TES has been working since 1947 to develop the skills and talents of its members and promote their friendship. It has approximately 31,000 members. Anyone who is a member of TES can participate in the Idea Expo.

\(^{12}\) Explicit knowledge is that which has been articulated in some form like text or tables.

\(^{13}\) Implicit knowledge is that which can be articulated. Its existence is implied by or inferred from observable performance/behavior.

\(^{14}\) Tacit knowledge cannot be articulated. The concept is captured through the statement: “We know more than we can tell.”
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engineers and included in task description documents. Toyota even had designated ‘green areas’ next to its production lines where employees could discuss work and any problems they anticipated during production on any day.

Another Toyota innovation that attracted the attention of other companies was the Yokoten System. Yokoten was a method of documenting and distributing knowledge at Toyota. Every team or workgroup contributed to a library of problem reports, and this was accessible to all in the organization. At its most basic level, it could be the use of the notepad that a team kept to record the history of the problems it encountered. Yokoten acted as a simple yet useful knowledge management device which transferred knowledge from the individual to the organization.

Toyota developed a world-renowned suggestion-screening system. The system helped to prioritize best practices depending on potential impact, advantages and complexity of implementation. Appreciating the system, Larry Prusak, director, IBM Institute for Knowledge Management, remarked, “Knowledge sharing means the freedom to ask questions. At Toyota anyone on an assembly line can ask a question. They type it into a terminal whereupon it is flashed on to a large display visible to the whole floor. Anyone can answer the question.”

Toyota also used web-based software tool called Analytical Problem Solving (APS) that helped users to collect problem data, find the root cause and develop countermeasures. It enabled users to determine if a problem had happened before; solve problems rapidly through a directed, efficient process; and receive coaching throughout the process as and when it was required. Both the Library function and the Reporting functions of the software helped the management review the process used to solve a problem and identify trends. This system used a question-based model to trace the root cause of the problem. Once the problem was identified, it was entered into the database for future reference. The system was capable of generating reports on open problems and on problems that had earlier been solved. Specifically, it reduced problem solving time, retained problem solving knowledge and reinforced the company’s Sensei system by optimizing the productive time of its expert consultants. The software further facilitated the use of Toyota’s intellectual capital to solve workplace problems and enhanced its ability to continuously use knowledge management for competitive advantage. Analysts recognized that Toyota used its people and technology in the right way for its KM initiatives. As Chase put it, “At Toyota, cross-functional design teams use both web-based as well as conventional techniques to link and exploit the distributed knowledge found in the company’s various communities of practice.”

A LEARNING SUPPLY CHAIN

According to experts, Toyota’s ability to form alliances with its partners enabled it to add tremendous value to its knowledge generation efforts. Toyota followed the JIT System to make its supply chain effective and adaptive. In the opinion of some experts, the Aisin fire crisis demonstrated how the power of extended networks could be used to a company’s advantage. Toyota successfully used its supplier network for creative knowledge generation and sharing which helped it to respond to changes quickly. Toyota’s supplier networks collaborated actively on joint training and building long-term relationships.

15 These documents provide a detailed description of the procedure to perform each task, the time allotted for it, the sequences to be followed and a check list that enables workers check their own work.
16 The green in ‘green areas’ refer to the plants kept in the area.
18 APS is developed by PHRED Solutions, Inc. based at Colorado USA which designs, builds and implements question based reasoning software systems. Toyota uses a customized version and calls it the Practical Problem Solving tool.
19 Sensei refers to a teacher; a Sensei guides workers in their problem solving activity at Toyota.
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An in-depth study by Dyer and Nobeoka\textsuperscript{21} traced the history of knowledge sharing among Toyota’s supplier network. Supplier associations (Kyohokai) at Toyota had existed since 1943. These associations had been sharing information and feedback on issues like cost, quality and safety of products and processes, on a monthly basis. Although various Toyota divisions interacted with the suppliers individually, the Operations Management Consulting Division (OMCD) played a key role. It had the responsibility of solving operational problems at the company as well as at the supplier sites. Consultation for problem solving was offered to suppliers free of charge. The system ensured a high degree of openness, and suppliers used to showcase the results of the process to any other supplier who was interested. Toyota developed multiple knowledge sharing processes and systems within its network. Its significant initiatives included the formation of Voluntary Learning Supplier Teams referred to as Jishukan, and holding Quality Management Conferences for suppliers. Another collaborative initiative between the company and its suppliers was the setting up of joint Problem Solving Teams. A unique practice that further facilitated knowledge sharing was need-based, inter-firm employee transfers that ensured tremendous value addition to the supplier. Through these practices, knowledge acquisition, sharing and dissemination were facilitated among Toyota’s suppliers. The researchers concluded that Toyota had handled the free rider\textsuperscript{22} problem associated with inter-firm knowledge sharing successfully by viewing production and quality as “non-proprietary knowledge”\textsuperscript{23}. Toyota successfully enabled reciprocal knowledge sharing by transferring the TPS system to its suppliers and made sure the suppliers collaborated openly to improve the system continuously.

According to experts, Toyota established that self organized human interactions were important to knowledge creation in an organization, and were more effective than formal practices with a hierarchical approach. What’s more, Toyota’s knowledge management practices underscored the importance of a combined approach which incorporates both technical and organizational initiatives for knowledge management.

**ORGANIZATIONAL LEARNING**

One of Toyota’s major initiatives in the area of organizational learning was the establishment of the Toyota University. The university had an academic structure with designations like the Dean and Associate Dean. It ran programs to cater to two broad categories of personnel — dealers, and the company’s own employees — on areas ranging from repair information to brand positioning. The University conducted many one-week courses for Toyota and Lexus dealers\textsuperscript{24}. The courses used role play videos to enable dealers to think from the customer’s viewpoint. It helped dealers generate higher penetration levels for Toyota products. Toyota encouraged its dealers to participate in these programs and though they were priced higher than the competitor programs, dealers were enthusiastic. The university also conducted rigorous certification training for dealers.

In 1999, the Toyota University launched e-learning courses for its employees in association with New York-based Element K\textsuperscript{25}. The initiative made available around 400 courses to more than 4,500 of its employees across the globe. The courses provided round-the-clock technological and business training, and covered a wide range of areas from personal computing to Information Technology.


\textsuperscript{22} Free riders are members who take the benefits from a collective resource/service but do not contribute to their share of costs for the use of the resource.

\textsuperscript{23} Only design and technology were viewed as proprietary knowledge at Toyota.

\textsuperscript{24} Since 1998.

\textsuperscript{25} Element K is a provider of e-learning solutions to corporations, educational institutions, government agencies and individuals.
In 2001, the Toyota University undertook a major project called “Insight” in association with Vuepoint Corp. to centralize and standardize web-based training by implementing an integrated Learning Management Solution (LMS). This enabled the training of around 50,000 Toyota dealer employees by providing 100 hours of on-line training ranging from repairs to financial management. Toyota was successful in making its e-learning programme just in time, hands-on and cost effective. It was just in time in enabling its learners to access an on demand tutor and providing several self-driven modules that assisted learners when they were stuck. Learners also had access to an online content library that stored updated articles and other resources. Simulation-based modules were offered in areas like customer service, finance, negotiation skills, business writing, and management training. For example, simulation-based software helped a user to learn to handle a difficult customer. The software would pose questions to the learner based on the previous responses and deliver a judgment on the response as desirable or undesirable. According to company sources, simulations provided near-real life learning while being less risky and quite cost effective.

In 2001, Toyota launched its e-business site called Dealer Daily to facilitate communication within its dealer network. It engaged the services of Leading Way and used its Knowledge One Content Manager product to generate content for the site. The site created and maintained consistent content and a well-developed knowledge base. It included a context-sensitive online help system with a keyword search function. The dealers were provided with printed user guides, quick references, product launch brochures and a multimedia CD-ROM as introduction to the application for quicker acceptance of the product. The company also used an extranet site for e-learning. The lessons were designed to simulate the situations faced by the dealer staff in their daily work and enabled learners to study at their convenience. The system also generated accurate reports on the progress of learning and development, and knowledge gaps. In the words of Spiros Fotinos, Head, Learning Technologies Group, Toyota Academy Europe, “We are challenged to provide e-learning that will continuously develop our people and support our business objectives.”

In January 2002 Toyota established the Toyota Institute. The aim was to train and develop Toyota’s internal human resources, integrating the training with Toyota’s core values. Toyota also established its Global Leadership School and its Management Development School as part of the Institute. The curriculum at the Toyota Institute was developed in association with the Wharton Business School. The Institute was also responsible for sharing best practices across the organization and drafting action plans. In the very first year of its establishment, it trained more than 750 employees.

Toyota established the Global Knowledge Centre in July 2002, as a specialized organization to share sales and marketing knowledge. The goal was to help distributors train their employees and continuously improve the sales and marketing processes. The company compiled its best practices as a case study and shared it throughout its global operations. The company also launched a magazine called “Team Toyota” that covered the Toyota Way in Sales and Marketing (TWSM) activities globally.

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26 Headquartered at New York, U.S., Vuepoint Corp. provides corporate e-learning software solutions for sales and marketing areas.

27 A Windows-based virtual private network that links the dealers' management systems to Toyota headquarters or to other business units. It allows dealers to order parts, download sales and other company information, file warranty claims and manage financing and insurance for customers online.

28 Headquartered at California, U.S., Leading Way develops knowledge system solutions in the areas of product knowledge, software knowledge and learning content management.


30 TWSM is based upon The Toyota Way 2001. It was created by the Overseas Marketing Division at Toyota to emphasize the principle of putting the “customer first” and the importance of integrated action by dealers, distributors and the company.
Toyota opened its Global Production Centre (GPC) in July 2003 as a hub for imparting training to a large number of mid-level production managers and for inculcating best practices among them (Refer Exhibit III-A). GPC had around 230 employees with the capability to train about 800 people. GPC enhanced the knowledge creation process at Toyota by facilitating global pilot production. GPC developed and used around 2,000 visual manuals on automotive assembly processes in an attempt to build a common base for manufacturing. (Refer Exhibit III-B for a snapshot of a visual manual). Employees learned the basics of standardized work, the JIT and the Andon System at the centre.

Toyota claimed that the GPC made learning faster and more effective for the employees. Through its simulation equipment, it enabled a virtual real life learning experience. Trainees also learned the skill to perform each task within a standardized timeframe, which was essential to maintaining Takt Time for smooth flow in assembly line operations. In addition to teaching specific skills, the centre also imparted knowledge in areas like safety, and the values of The Toyota Way. The GPC also added to the companies V-comm Digital Engineering capability. Employees were able to learn how to assemble new models at these facilities. Trained employees were thus capable of training teams at their own plant locations. Toyota claimed that GPC training enabled it to cut down the preparation time required to roll out full scale production of new models that used the same platform. After the establishment of the GPC, full scale production of new models took only a few months. Toyota had further plans to continuously enhance the curriculum, expand the facilities at the Center and increase its intake of trainees as well as to open GPCs in other major areas across the globe.

In October 2003, the company launched the “Toyota Values” document that described the shared values of safety, environmental protection and good faith that constitute the Toyota brand. Toyota also revised its existing Supplier’s Guide in March 2004. The Supplier’s Guide was aimed at suppliers who did not do business with Toyota but wished to understand Toyota’s purchasing policies and processes. The revision introduced the Toyota Way of thinking into the guide.

IMPACT OF CULTURE ON ORGANIZATIONAL LEARNING

KM practitioners recognized that Japanese culture had always considered learning as an important endeavor. The Japanese were also known for their love of detail and perfection which further drove learning. The characteristics of a typical Japanese organization like lifelong employment, teamwork and trust also contributed to a favorable learning environment. Many Toyota practices like Hansei, Kaizen and Nemawashi were in fact not specific to Toyota but were seen across

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31 In the Andon System at Toyota, any employee could stop production if he spotted a problem, by pulling the ‘Andon cord’ located near the assembly line. Lights are placed on machines or on production lines to indicate operational status. Green indicates normal operations, yellow stands for changeover or planned maintenance, and red is indicative of abnormality. The system is often combined with an audible signal such as music or an alarm and helps the supervisor locate the problem by observing the blinking light and the musical tone.

32 A German word, Takt meant rhythm or musical meter. Takt Time was defined as the time it took for each worker to complete his or her job cycle. Takt or rhythmical approach to movement was important for achieving proficiency in assembly line jobs. For example, in car-body painting, precise yet rhythmical body motion not only improved efficiency, but also helped assure complete and consistent paint coverage.

33 V-comm Digital Engineering technology enabled engineers in Japan and abroad to work together to optimize production processes. It enabled nearly simultaneous model changes at widely dispersed plants around the world.

34 Refer page eleven for details on Hansei.

35 Nemawashi referred to the concept of making decisions by consensus, after a thorough consideration of all options and followed by rapid implementation.
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most Japanese firms. Although practices like Kaizen encouraged learning on one hand, on the other they made it difficult for Toyota to implement explicit KM processes. The Kaizen concept ensured that processes underwent continuous change and the recording of these continuous changes became difficult. However, with increasing globalization and greater technological support, Toyota had increased its efforts toward explicit knowledge management.

Researchers felt that Toyota was actually able to bring out the tacit knowledge of its employees through mechanisms like “communicating for joint problem solving” and make it explicit for the use of the whole organization. This enhanced learning in the organization to a tremendous extent. Some researchers viewed the TPS as almost a contradiction. They felt that though the system was rigid in recording every activity, connection and production flow; it still remained flexible to customer needs. They attributed the uniqueness of the TPS to the use of the experimental workflow pattern. At Toyota, workers made a hypothesis and then tested it to observe the gap between actual and expected results. They were expected to observe problems, consult others on the problem and then experiment with a change. Once the change was implemented they reflected on it and improved upon it continuously. In addition, this experimenting was not forced but came from the employees themselves, due to the supportive culture at the company. Researchers like Steven Spears, acclaimed Toyota for providing employees with the resources they required for experimentation. For example, any employee who did an experiment was guided by a supervisor and was also helped by a maintenance worker say to open up a machine or to shift equipment. The Toyota Way viewed errors as learning opportunities. The Toyota Way Document 2001 stated:


Experts who have studied Toyota as a “learning organization” say that Toyota had been successful in standardizing the process of knowledge transfer. When an individual came up with an innovative approach, it was shared with the whole organization till a better approach was discovered. The main principle that enabled this was called Root Cause Analysis that traced the original cause of a problem using the Five Why Analysis. It was often a part of a seven step “Practical Problem Solving Process.” All employees were driven by the 5 whys and they were encouraged to ask questions to enhance their learning. Superiors only acted as guides while the actual problem solving was done by the employees themselves using the LAMDA methodology,

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37 Peter M Senge (a Senior Lecturer at the Massachusetts Institute of Technology. He is also Chairperson of the Society for Organizational Learning (SoL), a global community of corporations, researchers, and consultants dedicated to the “interdependent development of people and their institutions”) popularized the concept of the learning organization in his book The Fifth Discipline (1990). He described the learning organization as a place where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continuously learning how to learn together.

38 The seven steps included: Initial problem perception, Clarification of the problem, Identification of the Root Cause by the 5 why approach, Investigation of the root cause, Implementation of counter-measures, Evaluation of the results, and Standardization of the process.
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which stood for Look, Ask, Model, Discuss and Act (Refer Exhibit IV for details). According to Liker, the two important tenets that enabled Toyota to develop itself as a learning organization were Hansei and Kaizen. The term Hansei referred to a mindset of reflection. Its roots lay in the Japanese culture. According to Toyota, Hansei was the spirit that drove Kaizen. It imbibed the feeling of sadness that something had gone wrong. It further involved a review to solve the problem with a firm promise that individuals made (to themselves) about not repeating the mistake. The concept ensured that teamwork did not allow an employee to shun individual responsibility.

Toyota’s guiding principles emphasized the need to innovate, and ensured that the philosophy had support from the top management (Refer Exhibit V for details of the Guiding Principles). The policy deployment process at Toyota called “Hoshin Kanri” ensured that the organization was adequately directed and motivated to learn. The goal setting process was objective and included inputs from across the organization. Toyota’s performance measurement metrics were also more process oriented than result oriented. This again supported the culture of learning and the focus on improving processes was not lost.

**KM- BASED PRODUCTS AND PROCESSES**

Toyota launched one of its most commendable new products, Prius, in December 1997. It was the world’s first hybrid vehicle that used the T Hybrid Synergy Drive System developed by Toyota. The system enabled the Prius to run on both the gasoline engine and an electric motor. Unlike other typical electric cars the Prius did not need to stop to recharge its battery. Its gasoline engine recharged its electric motor. Auto analysts accepted that it was remarkably better than the available conventional vehicles in terms of fuel economy, engine efficiency and emissions. Experts considered the launch of the Prius as a milestone for Toyota. Prius was an innovative product that launched a new product line and used completely new technology, demonstrating the benefits of knowledge creation.

With the Prius project, Toyota beat its own record of having the fastest development process in the world. Though the Prius project used a completely novel design and technology, Toyota was able to reach the production stage within 15 months. This was especially impressive as hybrid technology was in a very crude stage at that time and Toyota had to carry out both research and development activities for the Prius simultaneously.

The Prius project enabled the company to create a new process for product development. Since Toyota was under strict deadline pressure to commercialize a new technology that was not fully developed, it could have created just a few engine designs and then tested them to arrive at the final prototype. However, the company preferred to try out as many as 80 hybrid engine designs and test them to arrive at the final choice. This process was referred to as “set based” concurrent engineering. The company developed many new practices which further enhanced its knowledge creation process. For example, it changed the process of design finalization. Earlier, the chief engineer used to create the design concept and then discuss it with design and planning groups. Under the new approach adopted for Prius, the chief engineer discussed the concept with not only the design and planning teams but also the production engineers. CAD systems were put in place to facilitate better management of information. The development of the Prius became an important learning exercise for the younger Toyota engineers. Toyota was also able to apply what was learnt in this project to its other products.

Other models that were a testimony to Toyota’s knowledge creation capability were the RAV4 which used hydrogen fuel technology, and the Highlander, the world’s first mass market seven passenger hybrid Sports Utility Vehicle (SUV). The Scientific American magazine awarded

39 Scientific American is a science magazine, published in the US since 1845. It provides insights into developments in science and technology.
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Toyota the “Business Leader of the Year” award in 2003 for commercializing this affordable hybrid vehicle. Apart from its legendary use of JIT and the Kanban, other process and system innovations introduced by Toyota were the concept of “Autonomation”\(^{40}\), the use of Poka-Yoke\(^{41}\) mechanical fail-safe devices to prevent mistakes; and the Single Minute Exchange of Die (SMED) system which reduced machine setup time to permit smaller lot sizes. Toyota also developed a new flexible assembly line termed the Global Body Line\(^{42}\) which contributed further to its cost advantage. This assembly line’s installation costs were half those of the system it replaced, and it could be modified to suit a new model for 70% less than Toyota’s previous production system.

**DELEVERING VALUE TO THE CUSTOMER**

In 2003, Toyota retained its position as the largest seller of a luxury car model (Lexus) in the US, for the fourth year in a row, beating BMW, Mercedes, Cadillac and Acura. Auto-analysts said it overturned the commonly-held assumption that a luxury brand would need decades to establish itself. Experts also acknowledged that Toyota consistently figured at or close to the top in terms of quality and productivity rankings in major independent surveys of the automobile industry. According to the J.D. Power and Associates\(^{43}\) customer retention study of 2004, the Toyota brand emerged number one. Toyota’s other brand Lexus was ranked second in the study. GM’s Chevrolet brand was adjudged a close third in the ranking. The survey indicated that Toyota retained 60.6% of its owners. The study was based on responses from 103,088 replacement vehicle buyers. The study further found that for every one customer that Toyota had lost, it gained six from other brands due its ability to add continuous value to its brand. As Neal Odes, director-product research, J.D. Power and Associates remarked, “Not only does Toyota offer its owners a wide range of vehicles to move up to as their financial means and stage in life change, but also the brand is highly successful in attracting new customers to the lineup, due in large part to its strong reputation for vehicle quality and high vehicle resale values.”\(^{44}\)

Toyota used market research data as the main input for its product design. Knowledge of the customer helped it improve its products. As an automotive consultant and analyst, Maryann Keller, remarked, “They make a car, and then they make the next one better and see where the customer is taking them.”\(^{45}\) Analysts acknowledged that the company had demonstrated considerable ability to convert tacit ideas from customers into successful products. Toyota delivered successful cars based on the phrase “Western Luxury” through its Lexus brand. Toyota was acknowledged as one of the Top Ten Brands in the World in the year 2004 Interbrand ranking (Refer Exhibit VI).

An interesting study by McKinsey revealed the power of the Toyota brand. It cited that despite the fact that the Toyota Corolla and the Chevrolet Prizm were built at the same NUMMI plant at California and had similar design and prices, GM had to shell out upto $ 750 in buyer incentives to achieve only a fourth of Corolla sales.

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\(^{40}\) Also called as Jidoka in Japanese, it referred to the use of machines and workers that stop a line or process automatically when abnormalities occur.

\(^{41}\) Pronounced POH-kah YOH-kay.

\(^{42}\) It was aimed at creating a production line that would ensure flexibility, so that Toyota production facilities around the world could easily add/switch new models or improve production of existing models within a short period while ensuring top quality.

\(^{43}\) Headquartered in Westlake Village, Calif., J.D. Power and Associates is a global marketing information services firm operating in key business sectors including market research, forecasting, consulting, training and customer satisfaction.


As Chase, remarked, “What sets Toyota apart is its ability to take its customer knowledge and turn it into products for the market-place. This attention to detail has enabled Toyota to become a leader in using knowledge to generate shareholder value.”

THE RETURNS

In 2003, Toyota’s profits of around $8 billion were more than the combined profits of General Motors, Ford and Chrysler. Again in the year 2004, it was the most profitable automobile company in the world with profits of $11 billion on revenues of $163.6 billion. The largest automobile company, GM, generated a mere $3.7 billion in profits on revenues of $193.5 billion. Between July 2004 to January 2005, GM’s share price fell while Toyota’s rose (Refer Exhibit VII for the share price chart).

However, the learning culture at Toyota did not permit it to pause. It renewed its efforts to refine its TPS to cut costs further to compete with low cost rivals from China and Korea. In 2004, it launched a basic platform common to five vehicle categories, called the Innovative International Multi-purpose Vehicle (IMV) project which was expected to generate big savings for the company. As Liker commented in an article, “New levels of leanness are being developed (at Toyota) as I write this commentary, while the Big Three have yet to learn from the older Toyota systems.” In its Vision 2010 document, Toyota stated that it planned to achieve a target of 8.5 million units by 2006 and challenge GM’s position as the No. 1 automobile company.

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Exhibit I

Key Knowledge Performance Dimensions – The Make Study

| 1. Success in establishing an enterprise knowledge culture. |
| 2. Top management support for managing knowledge. |
| 3. Ability to develop and deliver knowledge-based goods/services. |
| 4. Success in maximizing the value of the enterprise’s intellectual capital. |
| 5. Effectiveness in creating an environment of knowledge sharing. |
| 6. Success in establishing a culture of continuous learning. |
| 7. Effectiveness in managing customer knowledge to increase loyalty and value. |
| 8. Ability to manage knowledge to generate shareholder value. |

Source: www.knowledgebusiness.com

Exhibit II

Organization of Toyota Motor Corporation

Automotive
Automobiles are manufactured mainly by Toyota Motor Corporation (TMC), Hino Motors, Ltd., and Daihatsu Motor Co., Ltd., but a portion of manufacturing is consigned to Toyota Auto Body Co., Ltd. and others. Automobiles are also manufactured by Toyota Motor Manufacturing, Kentucky, Inc. and other overseas companies. Automobile parts are manufactured by TMC, Denso Corporation and others. These products are sold through Tokyo Toyo-Pet Motor Sales Co., Ltd. and other dealers and to certain large customers, directly by TMC. Overseas, sales are made through Toyota Motor Sales, U.S.A., Inc. and other distributors and dealers. In addition, Volkswagen vehicles are sold through TMC and some dealers in Japan.

Financial Services
This business involves the provision of loans and leases to customers and the provision of loans to dealers. Toyota Finance Corporation in Japan, Toyota Motor Credit Corporation and other overseas subsidiaries and affiliates provide sales financing for TMC's products and the products of its subsidiaries and affiliates.

All Other
Other business includes the design, manufacturing and sale of housing, telecommunications and other businesses. Houses are manufactured by TMC and sold through domestic housing dealers. Other major companies include Toyota Motor North America, Inc., which deals with public relations and research activities in North America, Toyota Motor Manufacturing, North America, Inc., which controls manufacturing companies in North America, Toyota Motor Europe, which deals with public relations activities in Europe, Toyota Motor Engineering & Manufacturing Europe, which controls manufacturing companies in Europe, and Toyota Financial Services Corporation, which controls the management of financial companies.

Source: Toyota Annual Report 2004
### Exhibit III-A

**Global Production Centre as a Hub for Learning**

![Diagram showing the Global Production Centre as a hub for learning](source)

### Exhibit III-B

**Visual Manuals Developed at Global Production Centre**

![Visual manual example](source)

*Source: www.toyota.com*
Exhibit IV
Learning within Toyota: The Lambda Way

Look
This stage focuses on the assessment of the real situation. The Japanese use the word “Gemba” which means ‘go to the place’ for this action. The objective is to understand the actual issues involved so that time and effort are not wasted on solving an apparent problem rather than the real one.

Ask
At this stage efforts are directed towards the identification of the root cause. The technique used for the purpose is called as the 5 why analysis. The approach uses a set of 5 questions to reach the root cause. Questions raised may take the form of why something happened and what caused it to happen. Successive questions are derived from the preceding answers to move past the symptoms and reach the root cause.

Model
This stage is concerned with developing a plan to tackle the root cause of the problem. The plan is kept as simple as possible and is written out to fit on an A3 size paper. It ensures that the solution is kept simple and is easy to understand. A record of all such plans is kept, adding to the existing body of knowledge.

Discuss
At this stage, discussion is used as a means to build a consensus on the solution. Proposed changes are then incorporated into the solution as per the suggestions received. The consultation ensures that the employees involved with the change understand the need and can also reflect upon and adjust their working according to the change. These discussions also double up as knowledge transfer mechanisms.

Act
The implementation of the solution is undertaken at this stage. By this stage employees understand the rationale behind the change and the actions that they ought to undertake to make problem resolution a success. Metrics to find out whether changes have achieved the desired results are not required as the process has a built-in mechanism to ensure the success of the effort. The whole cycle can be repeated to ensure continuous improvement throughout the organization.


Exhibit V
The Guiding Principles at Toyota

- Honor the language and spirit of the law of every nation and undertake open and fair corporate activities to be a good corporate citizen of the world.
- Respect the culture and customs of every nation and contribute to economic and social development through corporate activities in the communities.
- Dedicate ourselves to providing clean and safe products and to enhancing the quality of life everywhere through all our activities.
- Create and develop advanced technologies and provide outstanding products and services that fulfill the needs of customers worldwide.
- Foster a corporate culture that enhances individual creativity and teamwork value, while honoring mutual trust and respect between labor and management.
- Pursue growth in harmony with the global community through innovative management.
- Work with business partners in research and creation to achieve stable, long-term growth and mutual benefits, while keeping ourselves open to new partnerships.

Source: Toyota Annual Report 2004
### Exhibit VI

**Global Top Ten Brands**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Brand</th>
<th>Brand Value 2004 (In $ Billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coca-Cola</td>
<td>67.39</td>
</tr>
<tr>
<td>2</td>
<td>Microsoft</td>
<td>61.37</td>
</tr>
<tr>
<td>3</td>
<td>IBM</td>
<td>53.79</td>
</tr>
<tr>
<td>4</td>
<td>GE</td>
<td>44.11</td>
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<tr>
<td>5</td>
<td>Intel</td>
<td>33.50</td>
</tr>
<tr>
<td>6</td>
<td>Disney</td>
<td>27.11</td>
</tr>
<tr>
<td>7</td>
<td>McDonald’s</td>
<td>25.00</td>
</tr>
<tr>
<td>8</td>
<td>Nokia</td>
<td>24.04</td>
</tr>
<tr>
<td>9</td>
<td>Toyota</td>
<td>22.67</td>
</tr>
<tr>
<td>10</td>
<td>Marlboro</td>
<td>22.13</td>
</tr>
</tbody>
</table>

*Source: Interbrand Corporation, J. P. Chase & Co., Citigroup & Morgan Stanley.*

### Exhibit VII

**Share Price Chart: Toyota and GM**

*Source: [http://finance.yahoo.com](http://finance.yahoo.com)*
Suggested Additional Readings & References:

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