Chapter 6

Unique New Product Innovation Based on Holistic Leadership: A Case Study of Dyson

Abstract

This chapter analyzes and considers the relationship between original new product development processes and holistic leadership at Great Britain's Dyson. An innovative aspect regarding staff structure in the Dyson organization, unlike many development manufacturers, is the absence of differentiation between designers and engineers. All employees are "engineers," and all employees at all times are engaged in some sort of initiative in technology or experimentation. At Dyson there are product developers known as "designer engineers" who are responsible not only for technology, but also for design and development as they closely link function with design. All designers and engineers are involved in all processes from product concept planning and development until the final testing. In other words, unlike at many development companies, almost no knowledge boundaries exist between different specialist areas at Dyson.

Realization of such business processes at Dyson is achieved by practitioners at every management level including James Dyson (former CEO). Aiming for a single development goal, practitioners form business communities which originate with the formation of multilayered "Ba" that crisscross the company, irrespective of formal or informal organization, through holistic leadership. Through the formation of business communities, practitioners achieve strategic collaboration, which is the starting point of the company's product development concepts.

Keywords: Dyson; product innovation; teams of boundaries; communities of practice; exploitation; exploration

6.1. Overview of Dyson

Dyson is the first company to develop and manufacture the cyclone vacuum cleaner. Established in the town of Malmesbury tucked away in the Cotswolds in the county of Wiltshire, Great Britain, Dyson today still maintains its headquarters and research laboratories in this small town.

Former CEO and founder James Dyson once noticed that bag-type vacuum cleaners had to be changed even when the bags were not quite full. He then developed the dual cyclone vacuum cleaner that does not require a paper dust bag and has a filter that can be washed or replaced periodically. The bag-type vacuum cleaners had been popular for some time. They made vacuum cleaner care simple and easy but the substantial cost of the paper bags was a disadvantage. The high-end models with paper bags designed for hygienic disposal and odor control in particular meant using paper bag products that were even pricier. Instead of using a paper bag, the Dyson cyclone vacuum cleaner collects dust in a chamber that is emptied after use and is therefore more economical.

Compared with other cyclone vacuum cleaners or bag-type vacuum cleaners, the Dyson cyclone vacuum cleaner loses little suction power due to clogging caused by dust picked up by the vacuum cleaner. Exhaust air emitted during operation of vacuum cleaners is generally a concern but with Dyson's cyclone vacuum cleaners, the exhaust air emitted is cleaner than the air sucked in, and therefore can be used safely in homes where people suffer from allergies due to house dust. It has been said that the care required in cleaning the filter and dust chamber is a drawback in cyclone vacuum cleaners but there are two types of cyclone vacuum cleaners, and the high-end models that collect dust through centrifugal separation like Dyson's products have an automatic filter cleaning function, which make them easy to maintain.

6.2. Product Development at Dyson

Product development at Dyson has a number of distinctive features. The first is its emphasis on identifying who the consumers of its products are. In the days when Dyson manufactured its Sea Trucks with loading decks for use in marine transport, these boats had a modular design with various assembly options, so they could be used as either ferries or diving boats. The consumers, however, showed no interest in simple modules that could be assembled or rearranged, and the people who marveled at this modular design were the manufacturers, who praised the logic of the producers. Therefore, Dyson believes developing products from the consumer's perspective to be of utmost importance.

The second distinctive feature of Dyson's product development is its inventive ways of selling. In many cases, Dyson's products are reinventions of everyday goods that have been revisited from a new perspective. In its approach to product development, Dyson homes in on what it views as flaws from a design perspective in things we use every day, and this approach has come to be widely referred to as "doing a Dyson."

The third feature is the company's thorough "hands-on" approach. Dyson does not believe that inspiration comes from being in front of a computer or whiteboard. He believes it is essential for people to actually go to the factory and front line to observe how things are made. Dyson believes that only when employees learn how consumers use their products and what aspects about them they do not like will they be able to create what customers truly want.

The fourth noteworthy feature is product development based on a consistent trial-and-error process. When Dyson was creating a washing machine, he wondered whether he could replicate an action similar to hand-washing and created a washing machine with two drums to do this. Flexibly applying a concept based on the use of two counter-rotating drums that operated at different speeds, he was able to achieve a hand-washing action. The creation of prototypes became an integral element in the development process at Dyson. Up until the appearance in 1993 of Dyson's first successful cyclone vacuum cleaner, the DC01, he is said to have produced some 5,000 prototypes.

Dyson invests so much time and money on prototypes that he could be seen as a firm advocate of the adage, "Success comes only by learning from failure." Even to this day Dyson maintains a giant test facility on the ground floor of Dyson headquarters. It is there that Dyson staff examine with precision the durability of new devices while being continuously connected to a power source for 600 hours. A vacuum cleaner, for example, is tested by being moved back and forth repeatedly by a mechanical arm as it is tested on a variety of different carpet types to determine how quickly it can suck up test dust particles. The test area is also equipped with a cage-type device that automatically hits and drops products to determine which parts of them will break.

Dyson also gets new ideas from people and things around him. He got his idea for the cyclone vacuum cleaner from a nearby sawmill. During the night when it was dark, he went to the timber yard where the massive cyclonic centrifugal separator was located to sketch it. Watching it separate the sawdust from the flow of air and collect it in the dust chamber, he hit upon the idea that perhaps he could resolve the problem of vacuum cleaner bags getting clogged by dust by applying this same principle.

During development, Dyson also tested his fan heater from various angles. One of the major hurdles he had to overcome was maintaining the electromagnetic radiation emitted by the heater within the standards set by various countries. Because standards vary from country to country, he had to rearrange the electronic circuitry. Moreover, as the heaters were to be used in homes in countries such as the United States, Europe, Asia, and Australia, they were sent to those countries to be tested in the actual environments. At that time, however, Dyson was bombarded with complaints from the testers. Their complaint was that the silicon layer used to protect the ceramic component from humidity or damage emitted an abnormal odor when it got hot. The Dyson development team then set about producing and verifying a new prototype to rid the heater of this new problem, that is, the foul odor emitted by the silicon. It is this kind of repeated trial-and-error in its product development processes at Dyson that has led the company to success.

6.3. Product Development Environment and the Organizational Culture at Dyson

At many companies, it is customary for designers to be involved in the design of the exterior of products, or to design and sketch some of the components. The engineers then proceed to design the structure of the product. Next, the test engineers conduct tests on the product, and the mechanical engineers produce various items by using machines. This is the general way in which products are developed, and many manufacturers generally follow this business process.

A remarkable organizational feature in the personnel structure at Dyson is the absence of any distinction between engineers and designers. Until the release of the cyclone, countless prototypes were produced, and all staff across the organization were continually involved in various technical efforts and experiments. At Dyson there are product developers called "design engineers" who are in charge of not only technology, but also design, and Dyson's product development philosophy is to proceed with development by closely linking functionality to design. All design engineers are involved in every process of development from the planning and development of the product concept upto the final test. In other words, among the areas of specialization at Dyson there are almost no knowledge boundaries (e.g., Kodama, 2007c) of the kinds found in many companies.

Dyson says that he believes that design must be closely linked with research and development, and that new technology and design must be intrinsically linked to meet the needs of the market. In this process, the designers and engineers should be the same people. At Dyson, there is no such job as a designer. Moreover, there are no departments called the design department or styling department. As designers, all engineers think about new technology and the design that will embody this.

Dyson says that he wants engineers to be conscious of design at all times. For that reason, the company pays particular attention to design aspects in the office environment and the internal environment as a whole including cafés and other spaces. Not having employees wear suits is also part of the company philosophy, explains Dyson. This is because he wants staff to refine their sense of design by starting with what they choose to wear every day.

In this way, at Dyson it is not possible to consider engineering and design separately, and the company's holistic approach toward design means that there are almost no knowledge boundaries among the areas of design, engineering, prototype production, testing, and machining. Therefore, all members within a department must have a thorough understanding of all aspects of the company's business processes. Dyson always engages a number of design engineers for a single product and these design engineers develop the style (exterior) in tandem with the functions of the product.

At Dyson, technology and design are inseparable because choosing technology for an objective, and figuring out what functions and qualities are needed to accomplish the design become the final tangible result, that is, the product. It is not in Dyson's agenda to devote efforts to pursuing superior styling or to make vacuum cleaners look fancy. On the contrary, he views design and engineering as having a strong correlation and being part of the same work process. This means that staff members always know what's going on, and can enjoy being freely creative, which enables the company to produce new and novel products ahead of the competition.

In other words, ideally, this means it is essential for individuals to have diverse kinds of experience to eliminate knowledge boundaries among people. In this way, Dyson consciously forms "Ba" within and outside the company where he intentionally creates overlaps in knowledge in different specialist areas to enable individual employees to consider things from a comprehensive perspective (see Chapter 2 for a detailed explanation of "Ba"). To facilitate the creation of new knowledge, it is important to embed different specialist viewpoints among employees. Conversely, the separation of specialist areas becomes an obstructing factor in the new knowledge creation process (or knowledge integration process; Kodama, 2011a).

Furthermore, for the most part, Dyson likes to hire persons without experience and new graduates just out of university. He prefers the freshness of persons without experience to dyed-in-the-wool industrial designers, whom Dyson says he never hires. According to him, the young staff of the company have not been poisoned by the so-called "common sense" of the business world, and therefore are capable of spawning new ideas.

One of the main reasons he hires new college graduates is that they have not yet been jaded by society. According to him, they have never been tied up in suits or indoctrinated by a company to think only in terms of short-term profits and early retirement. Since Dyson is a new type of company, new graduates who are less likely to be entrenched in set ideas are much easier to train than mid-career employees who have set ideas.

On their very first day of work, all new recruits at Dyson without exception learn through hands-on experience how to make a vacuum cleaner. Likewise, through hands-on experience, they learn Dyson's corporate philosophy and, simultaneously, its corporate culture. Although at times there are young staff with little knowledge, there are also executives with abundant experience and talent. A middle management layer that includes capable senior design engineers develops from this combination of human resources.

It is Dyson's aim that young staff acquire deep knowledge from diverse experiences through the efficient and effective acquisition of tacit knowledge in the form of "innovative, flexible empirical knowledge," rather than from already established (or accumulated) existing empirical knowledge. Despite the time required to train staff using this approach, Dyson intentionally creates what may be considered a "waste of time" to enable staff to acquire empirical knowledge as rich tacit knowledge.

The "dialectical dialogue" (e.g., Kodama, 2007a, 2007b, 2007c) that takes place on a daily basis is also important at Dyson. Dyson thinks that if staff are sending emails to each other, it means they are not thinking about anything. They have to engage in exchanges in order to create something. He prefers face-to-face communication and places importance on the free exchange of ideas among employees. This is why the work floor where the design engineering department is located is an open area. In ordinary companies, the R&D division is in a separate location to ensure that persons outside the division do not know what is going on for security purposes or to prevent the leaking of information. However, Dyson adopted a different approach from that of typical R&D companies because of what he believed were the merits to be gained. This essentially comes down to the formation of "Ba" where Dyson consciously enhances the quality of dialogue.

Many companies call their research and development "R&D" but Dyson refers to this area in his company as "RDD" (research, design, and development). Dyson believes that staff put forward ideas and proposals one after another, and that these do not necessarily come from the staff's own areas of specialization. Because there is no division in processes within the company or in ideas of individual staff, the design and engineering departments are closely linked, and the production of prototypes and testing can move forward rapidly. Dyson firmly believes that fully understanding through experimental trials at an early stage the technical failures that can occur is a matter of top priority.

Dyson is not only the top executive of the company, but is also the chief engineer at the work site. All projects undertaken by RDD are reported to Dyson and he is involved at every stage of the product development, not just the final decision. At headquarters there are specialists in every area such as mechanical engineering and aeronautics. Dyson communicates with these specialists on a daily basis, and once a month discussions are held where Dyson also joins in. Dyson himself is a person who also participates in small group meetings and is a stickler for fine details. In the initial stages of product development, many design engineers hold countless meetings where Dyson is present. At that time, he plays a leading role in the intense dialectical dialogue which unfolds, calling attention to various aspects and providing guidance to the design engineers. Obtaining information beforehand on the prototype such as cross-sectional drawings and technical drawings, he is likely to ask which parts can be reduced in size, what improvements have been made since the last meeting, and what can be done to make the prototype even better.

Important aspects in the creative activities at Dyson are the continuous presence of the members and the ongoing, persistent "hands-on" practice of staff at the work site. Dyson has a flat organizational structure where even executives do not have offices of their own and all staff work in one large space. This daily commitment to "keeping the hands busy," in other words, daily engagement in practice itself leads to unexpected serendipity. In fact, the concept of the Air Multiplier emerged when it was discovered by chance in the course of developing a completely different technology that air could be amplified. Dyson happened to be watching a large-scale cyclone pick up and collect wood chips at a sawmill. Drawing upon that inspiration, he invented the Dyson dual cyclone. Furthermore, it must be extremely fulfilling for design engineers to be in an environment where they can immediately transform new ideas into prototypes.

To foster such an adventurous climate, Dyson purposely created within the company a university-like atmosphere. Scattered here and there in the courtyard of the company are sculptures made from things like recycled hot water cylinders that symbolize university students that might engage in discussion. Dyson thinks that he wants his staff to feel that they are at the cusp of great discoveries, and he very much wanted to create a campus-like space here (although nobody has ever called it that, that might not be a bad idea) because he did not want it to feel like a factory. This work space at Dyson is a very good example of a "Ba" for generating new ideas.

Because of the presence of this "Ba," an extremely free atmosphere pervades the entire company, and this atmosphere holds the secret to generating innovation. Pursuing the development of exciting new technologies and the application of existing technologies in novel ways generates superior characteristics at Dyson.

6.4. Holistic Leadership in New Product Development at Dyson

Dyson himself offers a definition of the expression "doing a Dyson," mentioned earlier. Says Dyson, "My inventions are design plus development plus manufacturing plus developing the market plus sales." He also adds, "I dislike the word 'business'."

He simply designs and engineers the kinds of new products and technology that people are eager to buy. So, He is basically a creator and designer of products. But he does not consider this business. He creates products that work properly, perform well, and that people enjoy using in their homes. That's the kind of creative work he does. He thinks business is about making money. It is not creative and never makes people happy. In other words, Dyson is essentially saying that business promotes creative activities through distributed leadership (an element of creative leadership; see Figure 3.2, Chapter 3) based on the close collaboration of design engineers at the informal organization layer that crisscrosses different organizations. At Dyson, such distributed leadership is functioning at the three management layers (top layer, middle layer, lower layer).

Likewise, Dyson has the following to think concerning the management, Management is necessary to get people to work together and to embrace the same philosophy. At Dyson, the philosophy is to create good products that they can get many people to use. Management is necessary to drive home the philosophy but management must at all times be there to serve design. What Dyson means is that the purpose of management is to bring together design engineers under the same philosophy and corporate vision, and not to restrict the individual design engineers from demonstrating their uniqueness as individuals by way of internal discipline or rules.

Dyson thinks that he believes it is everybody's obligation to be different. However, education and certain types of management attempt to make people compliant beings who do the same thing. That's because they are easier to manage that way. But in a company, that is not a good idea. In today's world where technology moves at a rapid pace, only those companies that skillfully master technology will survive. Therefore, it is important to have people think differently, be creative, and do things differently from their competitors.

Creating good products makes many people happy. Management is required for sharing such a philosophy, and to demonstrate such management, elements of centralized leadership (elements of strategic leadership; see Figure 3.2, Chapter 3) at the formal organization layer across the three management layers (top layer, middle layer, lower layer) are necessary.

The combination of centralized leadership for sharing the Dyson vision as a type of creed and the distributed leadership that enables Dyson employees to engage in creative activities is attributable to the embedding

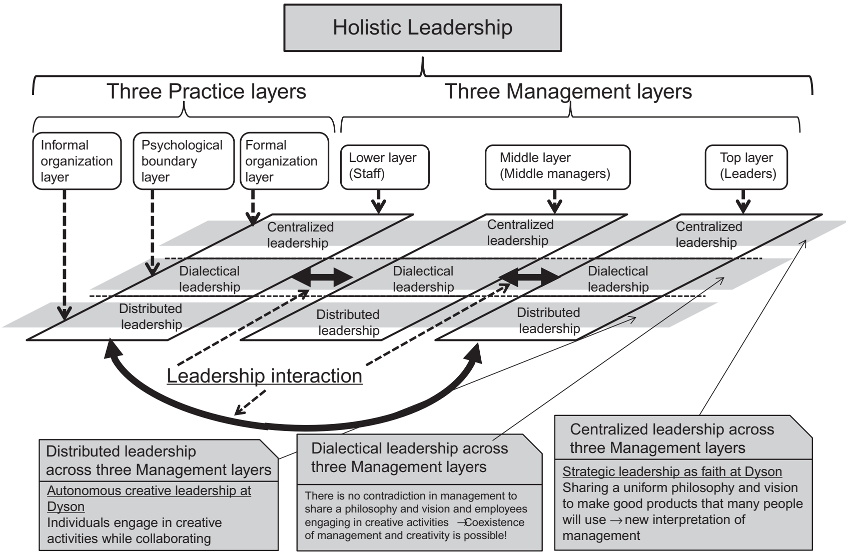


Figure 6.1: Holistic Leadership in New Product Development at Dyson.

of ideas and behaviors by Dyson staff including top management within the company through dialectical leadership by the three management layers (top layer, middle layer, lower layer) at the psychological layer.

Furthermore, thorough, productive dialogue and discussion to reconcile creativity and efficiency in new product development take place in RDD at Dyson through close leadership interaction at the three management layers including Dyson and the top management. At such times, compromise is never allowed. This type of thinking and behavior based on holistic leadership through the company's own corporate culture for product development is also a characteristic of leadership at Dyson (see Figure 6.1).

6.5. Dyson's Product Development Strategy – Module Innovation (MI), Architectural Innovation (AI), Modular Design (MD), and Module Transfer (MT)

At Dyson, the development of innovative, new technology to accelerate and miniaturize digital motors in the ongoing development of new types of vacuum cleaners has been a matter of top priority. Just recently, the company invested 50 million pounds and spent 15 years to develop a digital motor. In the past four years in particular, Dyson has concentrated on the miniaturization of a motor that maintains suction, and the outcome was the development of its new V4 motor. Compared with other Dyson products and typical motors used in ordinary vacuum cleaners to date, the advances in reduction of size and weight of the V4 were groundbreaking.

The most remarkable innovations in the new DC48 vacuum cleaner with the new V4 motor were the miniaturization of the motor and enhancement in the motor's "intelligence." These were major breakthroughs that resulted not only in reduction of the vacuum cleaner's size and weight, but also in improvement in collecting dust and significant noise reduction. Conventional motors in vacuum cleaners until then were "inept" motors that simply rotated. The V4, on the other hand, has a simple hardware design with the microprocessor built onto the main circuit board. The microprocessor detects the rotation of the magnet and is necessary for controlling the number of rotations. This processor is constantly making adjustments by increasing or decreasing the speed of the rotations. It is a design that is extremely sensitive to the balance of the rotations, and the achievement of this "intelligent motor" makes constant suction power possible. This digital motor module innovation (MI) is extremely important in the innovation of the product as a whole.

Furthermore, reduction of the size of the motor meant there was much more space in the interior of the vacuum cleaner body. Taking advantage of this space in the DC48, the design of the air intake path was made as long as possible. This was the key to keeping the noise of the machine to a minimum. The repeated bouncing off of the sonic waves inside the long air intake path made it possible to dampen the sound. Therefore, not only was the product body 30% smaller and the noise 40% less than the previous DC46, but the vacuum cleaner also maintained top-level suction power. Moreover, in terms of design, its compact size was also a significant advantage over competitor models. The pursuit of miniaturization is extremely important in the home environment in countries like Japan, for example.

In the innovation of the design of the overall product, architectural innovation (AI) involving methods of connecting the individual components that comprise the product was also an important element. As mentioned above, the creative elements in MI and AI played an important role in technological innovation.

Therefore, as a company that always pursues efficient engineering, Dyson aims not to develop products based on the image of completed products but to design and engineer products that specialize in functioning as efficiently as possible. Dyson also aims to develop products and technology that can maximize use of limited electric power and every gram of a product's components. The achievement of multiple functions using as small a number of components as possible was also the result of AI and MI conceived by Dyson.

Dyson's high-performance motor production facilities manufacture more than four million motors a year. Fifty robots and 22 parts are required to produce a single motor, and all motors are produced on a fully automated production line, so there are no irregularities.

Since 2011, Dyson has been measuring the impact of its production activities on the environment, and has been providing for the environment by increasing the efficiency of its production facilities.

Compared with conventional motors, the DC48 motor is extremely light and compact and has a smart design. The DC48 product as a whole is also light and compact, and because it is made of individual components that also have a simple structure, the overall product is refined and streamlined. There is also a connection between the design of this simple structure and Dyson's fully robotized production line. Creation of parts that the robots would "find easy to make" was something the design engineers were ultimately aiming for.

To create, mass produce, and distribute a complicated digital motor that does not allow for inaccuracy, refining the components was an important issue. It goes without saying that achieving a fully automated accurate production line was also essential. To achieve that, Dyson invested 50 million pounds to build a new production facility in Singapore.

To design products that even robots will be able to produce, from the outset the design engineers have to come up with modular designs (MD) with thoroughly efficient production processes. Therefore, as the team leaders, the senior design engineers involved in the DC48 project had to make fine adjustments for the mass production of the digital motor and set up automatic production processes in Singapore. The basic ideas for the new products and the processes responsible for innovation are all undertaken at headquarters in Great Britain while the final manufacturing processes are undertaken in Malaysia and Singapore.

Moreover, the fourth noteworthy characteristic of Dyson is its Airblade Series 3 model, which it developed and began selling from April 9, 2014. The Airblade Series 3 is a hand dryer with a brushless DDM (Dyson digital motor) V4 developed by Dyson. Says Dyson, "I established Dyson to resolve various persistent problems and frustrations. I had a mass of complaints about conventional hand dryers. They took a long time to dry the hands and made a lot of noise. They were not very hygienic and they consumed a lot of electricity. We then started to think of a completely different way of drying hands. Our idea was to use an "air blade," a sheet of blowing air that scraped the water droplets off the surface of the hands." The unique compact, powerful Dyson digital motor (DDM) is to play an important role in "scraping" the droplets of water from the hands through the force of the air.

After distributing the dual cyclone vacuum cleaner throughout the world, Dyson proceeded to release the Airblade hand dryer in 2007 and today it is in use in public toilets in airports and museums. Dyson subsequently released the Air Multiplier, an innovative type of fan, and also commercialized the hand dryer as a new product. These three types of products (vacuum cleaner, fan, and hand dryer) have a number of common technical aspects. First, the core element (the so-called core module or core component) in all of these products is the digital motor, which applies technology to create a flow of air.

In this way Dyson aggressively deployed its digital motor technology, one of its assets of core competence, to other products through modular transfer (MT) of digital motor technology, and this is also a noteworthy characteristic of Dyson.

6.6. Dyson's Product Development Framework

The organizational framework of Dyson is basically flat. The functions of the organization, which are quite varied and diverse, include design engineering (with headquarters in the United Kingdom and operations in Singapore in charge of core RDD work; operations in Malaysia also have an RDD function centered on engineering and production systems technology as well as operational technology), production technology (technology management work including enhancement and improvement in areas such as operational technology, procurement, quality control, and IT mainly in Malaysia), production (mainly in Singapore), and sales, services, technical support, marketing, finance, PR and advertising, and general affairs including personnel (mainly in the Great Britain where Dyson's headquarters is located, the United States, and Australia).

In structure, the organization of Dyson differs from the organization chart of typical companies in a number of ways. First of all, there are basically very few barriers that divide the organization. All teams always work as a single entity in what could be described as a "boundaryless company." There is an established organization culture that employees of the entire company share information concerning various issues and customer needs, members transcend different organizational barriers to work in unison for resolving problems and issues.

Ordinary routine business in areas such as production technology, manufacturing, sales, services, technical support, and general affairs is for the most part undertaken by the functional organizations. On the other hand, when it comes to new product development, design engineers with backgrounds in diverse specialist areas (design, core component development, and development, testing, and evaluation of systems, etc.) form design engineering teams to develop new models and technologies (these are equivalent to ToB; see Column 4.2 in Chapter 4) based on feedback from other departments and customers and customer needs. A design engineering team engages in the full range of product development tasks including the design of the new product and new technology as well as the development, prototyping, and evaluation of these. The most important task for a design engineering team in skillfully managing the organization, however, is to refrain from creating barriers between areas of specialization and organizations.

A design engineering team without barriers between areas of specialization and organizations is believed to have an environment where Communities of Practice (CoP), which are functional groups characteristic of ToB, share information and knowledge on a regular basis across different functions and where project teams across different organizations are easily formed (Kodama, 2007c; Kodama & Shibata, 2014b).

As noted in the product development process, the organizational culture and in the workplace at Dyson, the existence of "Ba" can be found everywhere throughout the company. The presence of various "Ba" observed within Dyson results in promoting knowledge creation processes within the company. First is the presence of temporal "Ba" of experience. All new recruits who join Dyson engage in the production of vacuum cleaners without fail on their first day of work at the company. All staff down the line including part time director former Minister of Trade Richard Needham, who joined the company as an export advisor, are required to make vacuum cleaners.

James Dyson maintains the belief that everyone should be capable of doing everything, and by having everyone join in making Dyson vacuum cleaners, he aims to create an opportunity (in other words a temporal "Ba" of experience) where employees come to understand the virtues of the structure, functions, and design of Dyson's products. He believes that by using the things they produce on a daily basis and appreciating their merits, employees will be able to understand the company's ideals and its *raison d'être*. In the course of this valuable experience of training in making vacuum cleaners, it is even possible to have staff who are only minimally involved in the actual manufacturing to gain an understanding of the products. The existence of such a temporal "Ba" of experience generates "power in harmony" where all employees share the corporate ideals and values as a company. Furthermore, this "power of harmony" integrates different types of knowledge and leads to the realization of new knowledge creation (Kodama, 2007c).

Second, it exists in a spatial "Ba" that enhances the quality of dialogue. The existence of a spatial "Ba" induces in employees "holistic thinking" (e.g., Kodama, 2011a) that takes in the design as a whole. James Dyson has introduced into the company an interior designed by the employees themselves. For example, interior spaces with purple shading and tables with an avant-garde design have been introduced as part of the decor. At a cost of 400 pounds each, the company also purchased luxurious chairs designed by the famous designer Antonio Citterio for each of its staff. As an important element in office design, Dyson took into account that these chairs would enhance the employees' ideas and sensitivity regarding design.

The intention was not only to create an innovative office design. The open design of the office is meant to create a sense of unity where the employees can communicate as a single team through deep dialectical dialogue. The design engineers, who could be said to be the core of Dyson, are stationed at the center of the office as if to indicate that the company's strength is centered on design and engineering. Between the individual organizations and departments there are neither partitions nor walls. As a result, everyone can move about and exchange opinions freely. In this way, Dyson deliberately created within the company spatial "Ba" that enhance the employees' awareness of design and encourage the pursuit of creative work. This structure also leads to promotion of the knowledge creation process.

Third, the office exists in a psychological "Ba" that connects different types of specialist knowledge. Because it is important for staff to consider engineering and design simultaneously, designers participate in testing and, likewise, engineers take part in the concept creation process. Unlike other companies where designers concentrate on the external design and engineers on the structural design of the product, as noted earlier, at Dyson there are few barriers (in other words, knowledge boundaries) among the respective areas of specialization. All people who belong to the same department engage in all aspects of that department's work. Therefore, as a matter of course, all employees are capable of understanding "the big picture" of what they are doing and can enhance their freedom in new creation and ideas. That freedom of creation is what makes the product development process at Dyson innovative.

Dyson places importance on enhancing the creativity and thinking capacity of all employees. While it may be true that many of the ideas that are forthcoming at Dyson come from the department in charge of RDD, this is not always the case. For example, Dyson is the only company to place the telephone number of its customer service center (the service department) on the handle area of its products, and the idea for this came from one of Dyson's service desk staff. In this way, Dyson is able to improve on its products from the ideas of people from other departments. This ethos also enhances the creativity and thinking capacity of the employees themselves and leads to the promotion of new knowledge creation processes. Dyson also incorporates the mechanism of psychological "Ba" that links different types of specialist knowledge and embeds it in employee's mind as the organization culture.

Therefore, three types of "Ba" – temporal "Ba" of experience, spatial "Ba" that enhance the quality of dialogue, and psychological "Ba" that link different types of specialist knowledge – exist dynamically at all times at Dyson, and these "Ba" dynamically mobilize the creativity and imagination of the employees, which in turn generates new meaning. As a result, it can be assumed that "Ba" for dynamically sharing new contexts among employees will be formed. Moreover, the formation of "Ba" also leads to the foundation of an organization that forms Teams of Boundaries (ToB) and generates new innovation in the form of knowledge creation processes (see Figure 6.2).

As explained in Chapter 2, the knowledge creation process resulting from the formation of "Ba" is a strategic method of the organization management used to resolve issues, and to constantly generate new knowledge and wisdom, an innovative company forms "Ba" in real spaces and virtual spaces using ICT, and creates communities that include ToB based on the multilayered "Ba" as a starting point. Another notable characteristic of Dyson is its ability not only to create knowledge, but also to skillfully form and manage organization environments in which knowledge can be transferred, shared, and utilized, and "Ba" that create knowledge.

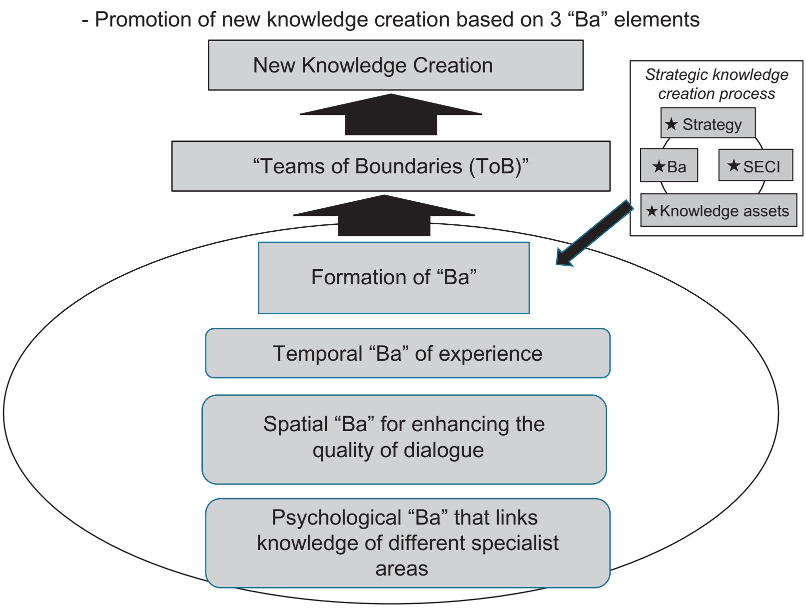


Figure 6.2: RDD (Research, Design, and Development) at Dyson – Promotion of New Knowledge Creation Based on Three "Ba" Elements.

The creation of "Ba" that create knowledge at Dyson promotes the formation of communities, which are ToB where the necessary people and necessary departments and units can engage in communication and collaboration without being constrained by an organizational framework.

Coordination skills are required of employees at all management layers (three management layers) of each organization to appropriately link as necessary knowledge activities that are undertaken simultaneously and frequently by various groups and various "Ba" within the organization. As mentioned in Chapter 2, one fountainhead of strategic knowledge creation is the formation of communities that begin with the building of "Ba" based on the knowledge vision and driving objectives. Within "Ba" that have been built, employees deeply share micro strategy contexts and find the necessary knowledge assets for the development of new technology and enhancement and improvement activities from within the "Ba" arrangements within the organization, and they capture and mobilize assets that have been appropriately provided. Furthermore, the latent potential of "Ba" that have been built is transformed to SECI.

6.7. New Product Innovation through Holistic Leadership

This section will consider how the elements of leadership of Dyson as a company can be interpreted in light of its product innovation activities and the organizational framework described so far.

Routine work at Dyson such as production technology, manufacturing, sales, services, technical support, and general affairs (including improvement and enhancement work) is mainly conducted in the respective functional organizations and through cooperation among the functional organizations as CoP. On the other hand, when it comes to new product development, the RDD design engineers, who have backgrounds in diverse specialist areas, are organized into design engineering teams to develop new products and technologies based on feedback from customers and latent needs. This means that Dyson selects an appropriate organization form and executes exploration (innovation activities), which is advanced new product development work with a high level of uncertainty and exploitation (learning activities), which is routine work including improvement and enhancement work.

The new product development design engineering teams are Teams of Boundaries (ToB), which have elements of a Collectivity of Practice (Col.oP) as a project organization and elements of CoP as various functional organizations (see Figure 6.3).

This is because from the time they join the company, employees of Dyson, irrespective of the work they engage in, exist in an organization

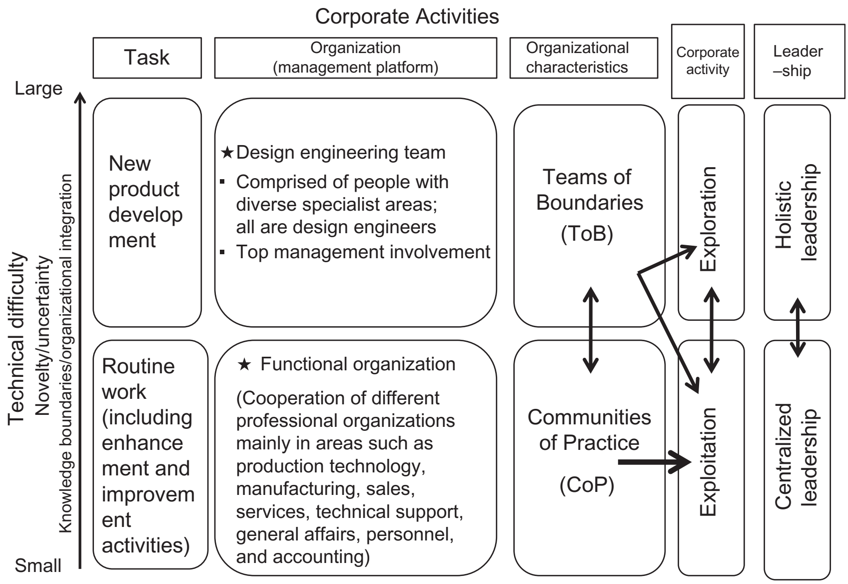


Figure 6.3: Characteristics of Dyson's Organizational Morphology and Corporate Activities.

culture where as individuals they share a common philosophy and vision of promoting creative activities. In other words, even the design engineers involved in work relating to different specialist areas (such as the development of technology for digital motors and other core modules, new product development, and new production systems) have characteristics as a CoP due to their sharing of common values throughout the company. To express this in another way, the design engineers have a sound understanding of exploitation, which is their routine work, and they experience such work on a number of occasions to the point where they absorb it as tacit knowledge.

For example, Matt Steel, who is a senior design engineer, has been involved in the research and development of a number of products at RDD at Dyson headquarters in Great Britain. At the time of the development of the DC26 motor head in particular, as the person in charge, he was involved in all aspects from the design of the product concept at RDD up to the manufacture of the product in Malaysia. At present, Steel is based in Singapore where he is in charge of research and development for the manufacture of the DDM V4, which is built into the DC48. He is involved in a broad range of specialist areas. Essentially, Dyson employees learn work content in a range of areas across the entire value chain and supply chain from exploration to exploitation.

Furthermore, the organizations that execute daily routine work such as production technology, manufacturing, sales, services, technical support, and general affairs (including enhancement and improvement work) are existing functional organizations. In functional organizations, knowledge transfer and knowledge sharing among members are actively promoted as group knowledge is amassed in CoP through daily learning.

As an organizational framework, Dyson has a dual layer arrangement consisting of design engineering teams, which are ToB that cross specialist functions within the company, and functional organizations, which constitute CoP, and Dyson simultaneously manages new product development and routine work by dynamically forming ToB within the company. Moreover, management at Dyson enables the simultaneous pursuit of product innovation (exploration) in the form of new product development and, at the same time, process innovation (exploitation) in areas such as production, sales, and services based on efficiency (see Figure 6.3).

In the functional organizations, work (exploitation) that has been standardized such as production technology, manufacturing, sales, services, technical support, and general affairs (including improvement and enhancement work) is executed through internal procedures, such as company discipline and rules, and decision-making processes that have been systematized beforehand, and these functional organizations mainly require centralized leadership at the formal organization layer. Although elements of knowledge creation activities even in improvement and enhancement activities are not completely absent, the level of distributed leadership involving knowledge creation activities at the informal organization layer is relatively minor.

Furthermore, work activities such as production technology, manufacturing, sales, services, technical support, and general affairs are already executed according to established practices and rules. Therefore, the level of interaction and boundary negotiations with distributed leadership and centralized leadership at the psychological boundary layer is relatively insignificant. Therefore, exploitation in the form of everyday learning is mainly controlled by centralized leadership at the formal organization layer.

On the other hand, the elements of new knowledge creation are significant in the work of design engineering teams as ToB, which are development projects for new models and technology that promote exploration. As also noted in Figure 6.1, the promotion of holistic leadership simultaneously with creative activities to develop new products based on distributed leadership and the establishment of a faith to penetrate and share a coherent vision through centralized leadership across the three practice layers of the informal organization layer, psychological boundary layer, and formal organization layer as well as the three management layers occur in the design engineering teams as ToB.

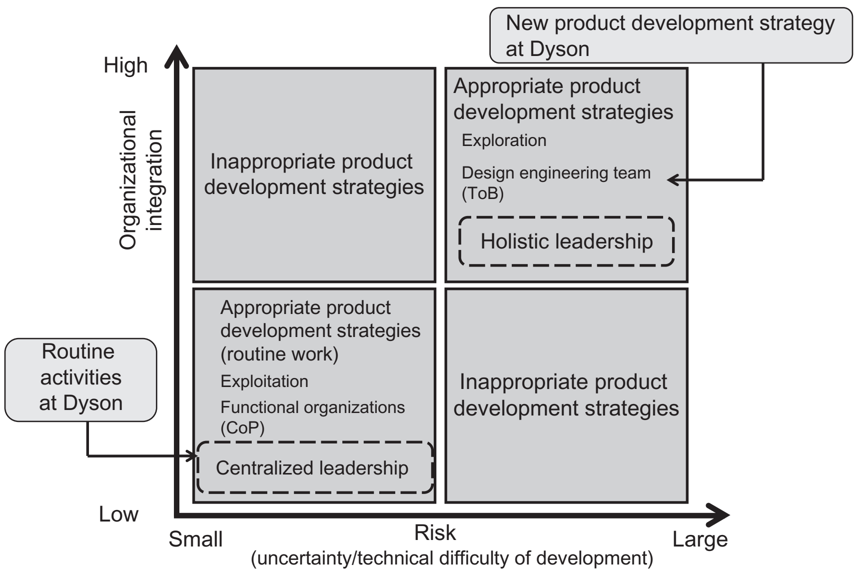
The author now considers the company's product performance from the perspective of product development in regard to such organizational forms and leadership. There is a considerable amount of precedent research concerning the relationship of product development performance and the degree of organizational integration (e.g., Allen, 1970; Song, Montoya-Weiss, & Schmidt, 1997). For example, it has been indicated that the level of communication resulting from the building of internal communication networks has an impact on the performance of the R&D organization (Allen, 1970). In particular, the communication interface between marketing and the R&D organizations is related to the success of product development (Griffin & Hauser, 1996). Furthermore, in product development where the environment is uncertain and development risk is high, a strong level of integration among organizations is said to enhance the success of product development but there are also reports that indicate the level of organizational integration should be selected on the basis of the degree of difficulty of the product development (Gemser & Leenders, 2011). This is because knowledge boundaries exist among different organizations, and the organizational behaviors of practitioners in regard to differences stemming from these knowledge boundaries (Dougherty, 1992; Griffin & Hauser, 1996; Lawrence & Lorsch, 1967) have an impact on product development processes and upon performance.

In regard to such organizational integration, precedent research (Kahn, 1996) indicates that there are behaviors of interaction and collaboration among practitioners in organizational relationships in product development. "Interaction" in this case means a relationship of moderate integration among functional organizations in a structural organization and exists in human and organizational relationships for the sake of so-called routine work conducted through means such as internal rules, work manuals, telephone contact, e-mail, and meetings, etc. These equate to "exploitation" mentioned earlier. From a context of product development theory, this equates to product development processes based on a traditional sequential model (Cooper, 1990), and is also a product development process of routine innovation involving production technology, manufacturing, sales, services, technical support, and general affairs of existing products (including enhancement and improvement). Another interpretation is routine work consisting of moderate interaction with CoP in various organizational functions. In terms of routine work such as production technology, manufacturing, sales, services, technical support, and general affairs of existing products (including their enhancement and improvement) at Dyson, the level of organizational integration among the respective functional organizations can be described as a moderate relationship rather than an organizational morphology such as design engineering teams that promote "exploration."

At the same time, collaboration occurs in an organizational relationship that is informal and unstructured and crisscrosses functional organizations, which are formal organizations corresponding to project organizations that promote "exploration" in cross-functional teams where there is a strong degree of integration among organizations. Collaboration restricts the negative thinking and behavior of practitioners among different organizations and specialist areas. It is also a necessary element for generating creative abrasion and productive friction. Therefore, the presence of collaboration as a function in ToB and Col.oP is important. In the design engineering teams at Dyson, the level of integration among organizations in the various functional organizations is strong.

According to precedent research (Gomes, Weerd-Nederhof, Pearson, & Cunha, 2003), to succeed in routine development through the enhancement and improvement of existing products, "interaction" at a low level of integration is important. On the other hand, this research indicates that to succeed in new product development with high risk (uncertainty and level of difficult in developing technology), collaboration where integration is strong is a necessary element. Conversely, this suggests that in the case of enhancement and improvement (including routine work) of existing products with low risk, ToB and Col.oP are inappropriate as organizational forms, and that when risk is high and the level of technical difficulty is high, existing routine organizations are inappropriate (Gemser & Leenders, 2011).

In light of the above discussion and referring to existing experimental studies, if the functional organizations and design engineering teams at



Source: Compiled based on Gemser and Leenders (2011)

Figure 6.4: Organizational Relationships and Business Characteristics in Product Development, etc.

Dyson were appropriately positioned as applicable organizational forms on a dimension of organizational integration and risk (uncertainty and level of difficulty in developing technology), they would appear as shown in Figure 6.4. In other words, the selection and execution of appropriate organizational forms are essential for "exploration" (where uncertainty is high and advanced new product development work is involved) and "exploitation" (the routine work of production, sales, and services of existing products including enhancement and improvement). Conversely, this means that, depending on the level of development of the target product and the work content, parallel development of a product development strategy with "exploration" and "exploitation" is possible with the appropriate allocation of resources that have the necessary organizational forms.

In other words, with its two-layered organizational form and the positioning of its product strategy, Dyson is a company that appropriately manages two organizational forms (differences in the level of organizational integration) appropriate to environmental conditions (risk: uncertainty/level of difficulty in technical development) and achieves optimal new product development performance and routine activities. At the same time, Dyson can be viewed as a company that promotes new product development and routine activities along with "exploration" and "exploitation" through the coexistence of holistic leadership and centralized leadership.