
Introduction of Honda R&D Innovation Lab Tokyo

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ABSTRACT

The Honda R&D Innovation Lab Tokyo in Akasaka Biz Tower was established for product development in new areas related to artificial intelligence technology.

The standpoint of the people engaging in research and development was put first in creating this lab facility. A variety of different thoughts and hopes were therefore incorporated through open-minded collaboration that involved the architectural design firm and construction contractors.

Those thoughts and hopes were given concrete form in various ways. In addition to color, acoustics, and lighting design, there are discussion wagons and Dokodemo White Boards for a more effective use of space, smart frames surrounding them, stools with built-in storage space for water containers and other furniture, the displays of Honda items on bookshelves and glass walls for stimulating creativity, objects used to indicate the directions being taken in initiatives, idea generation-support systems, and other such implements and furnishings.

As a result, the Honda R&D Innovation Lab Tokyo received a New Office Promotion Award from the New Office Promotion Association.

1. Introduction

Remarkable advances have recently been made in artificial intelligence⁽¹⁾. In a field of technology that is making such rapid progress, co-creative work through open, generous exchange with researchers at universities and other companies is considered to be effective. Therefore the Honda R&D Innovation Lab Tokyo (hereafter referred to as HIL-TK) was established for the purpose of product development in new fields related to artificial intelligence, and it was situated in Akasaka, which is convenient for transportation. This laboratory was built through open-minded collaboration that involved the architectural design firm and construction contractors, and it incorporated a variety of ideas intended to realize a work-friendly environment. The result has been very highly regarded, and it has received the New Office Promotion Award⁽²⁾. The first part of this paper describes the course of events leading up to the realization of HIL-TK, and the last part introduces the laboratory with the thoughts and hopes built into it. The purpose of the paper is to provide a reference for the creation of new research facilities in the times ahead.

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Fig. 1 Entrance to Honda R&D Innovation Lab Tokyo

2. Concept

2.1. Key Words, Directions, and Conceptual Images

The thoughts and hopes that informed the process of designing HIL-TK was “to bring about a change in Honda’s

R&D labs from this point forward.” This first involved isolating the key words that represent HIL-TK.

Full immersion
Dejima (gateway island)
Open
From non-existence to existence
Move Fast
Innovation
Tackle even the foolhardy challenges
Cheerful and energetic

Next, the statements that HIL-TK was intended to convey inside and outside of the company were put together in orderly form:

- ✓ Escape from the business of selling off hardware that has been pursued so far, and transform into a company that engages in innovation.
- ✓ Generate innovation at the same rapid-seeming pace as software venture companies.
- ✓ Switch from in-house only development to openness and flexibility to engage in development through open innovation.

As a further step, the conceptual approach to apply in designing the HIL-TK space was put into organized form on the basis of those statements.

Given the likelihood that administrative processing will be shifted over to computers (AI) in the times ahead⁽³⁾, it is going to become more important for researchers to engage in creating new value. It appeared likely, therefore, that they would need to create a place where they could do their work, and they would need the flexibility to go on changing with the times. This view is expressed in Fig. 2.

2.2. Site

In order to turn new technology into products, it is desirable for the developers to situate themselves at a location where there is an active exchange with people from inside and outside the company. There they should expose themselves directly to trends in society and stimuli of various kinds, and absorb it all in themselves. In order to carry on active exchanges with a variety of different people and generate new ideas, it will be important - even in the present era of advanced information telecommunications -

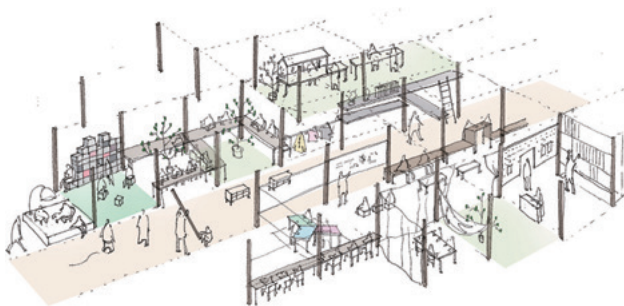


Fig. 2 A laboratory that we create ourselves and upload, and that continues to grow

Table 1 Constraints imposed by a high-rise building and responses to those constraints

Constraints	Responses
Low ceilings and limited floor load capacity	Use existing laboratories for large objects. Take visual steps to address oppressive ceiling feeling.
Building entry through flapper gates feels bothersome	Leave door to entrance area open
Feel out of touch with the changing time and seasons	Use lighting to represent the changing time and decorative plants that also function as partitions to produce a sense of the seasons
Area is limited	Use equipment and fixtures creatively for conferences, experiments, and other such functions

for people to actually meet face to face and discuss matters with each other. The laboratory site selected for that purpose was the 27th floor of Akasaka Biz Tower located where people and information accumulate in the Tokyo city center.

2.3. Constraints and the Incorporation of Constraints in Specifications

The constraints imposed by location in a high-rise building, shown in Table 1, were incorporated in the specifications. Construction was carried out so as not to inconvenience other building residents, with work involving noise and vibration limited to weekends, and late night to early morning hours on weekdays. As a way of shortening construction time, therefore, effective use was made of the existing floors, ceilings, and walls, which required on-site work, while the furniture that people come into direct contact with on an everyday basis was specially designed to create contrasts with the overall features of the space.

(1) Field of vision

A unified space was created by not building any new interior walls. People would be able to see outside through a window as long as they stood up, and feel as though they could set their gaze to a distant view, toward the future, instead of feeling stuck inside a deep, narrow space like an octopus pot. The heights of the furniture items were also kept even for that purpose. The space was configured to guide people's view away from awareness of the low ceilings.

(2) Colors

Taking on the challenge of something new generally involves uncertainty. Since the colors that people are exposed to on an everyday basis are important elements in determining how they feel, a bright, warm color scheme was applied to the space as a whole to stimulate feelings of vitality. The design visualizes a space in which people will tend not to feel gloomy even when they are disappointed because things are not going well⁽⁴⁾.

(3) Acoustics

The aim was to create a space in which lab personnel could fully immerse themselves in their work. Widespread use was made of materials selected for sound-absorbing

properties so that people could converse in normal voices and hold conversations more easily without interference from reverberating sounds.

(4) Lighting

In order to lessen glares on computer displays, areas near windows were made into refreshment areas and “free address” areas, which are sections with unassigned seating. The lighting was also designed to allow people to sense the passing of time during the course of the day.

(5) Meeting rooms and testing rooms

In order to express a feeling of openness, walls and doors were made from transparent glass that does not block people’s views.

(6) Devices and arrangements to induce realization

Numerous refreshment areas and “free address” areas were set up so that people could hold discussions and conversations in different atmospheres.

Sidebar: Designers favor dark colors

Looking stylish or having a high-quality appearance is important for the interior decoration of shops that deal in luxury goods, as well as in residences for the wealthy. Such places are inundated with grays and dark colors. This is definitely stylish. It would be out of the question, however, to block the windows at HIL-TK, where natural light comes pouring in through windows surrounding the space on all sides. HIL-TK is a place intended, from the very start, for bringing new things into being. Making it dark may make it calm, but being all calmed down would be counterproductive. Activity to bring new things into being calls for a space where the mind is vigorously engaged. The designers were told in no uncertain terms that grays were not allowed.

2.4. Promotional Structure

The Preparation Project was organized for launching HIL-TK. The promotional structure shown in Fig. 3 was arranged so that all information would be gathered in the HIL-TK Preparation Project. This was intended to keep information from becoming tangled up in complexities and to speed up decision-making.

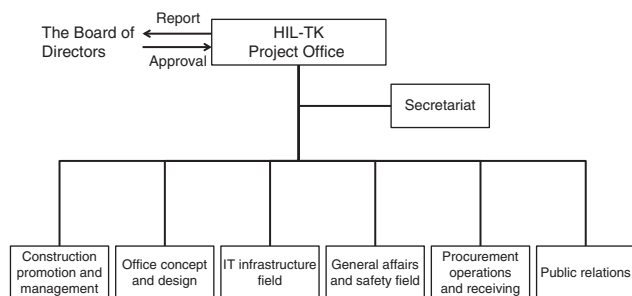


Fig. 3 Structure for promoting HIL-TK

2.5. Construction on the Three Realities Principle

Temporary partitions were installed in some floor sections before construction started. Temporary office areas were set up in those sections and regular research and development work proceeded while the HIL-TK specifications were being studied. It was as though the preparatory team set up camp on the very place where construction took place, and they studied how to make effective use of the site characteristics on the spot. The schedule is shown in Fig. 4, while Figs. 5 and 6 show the site before and after construction, respectively.

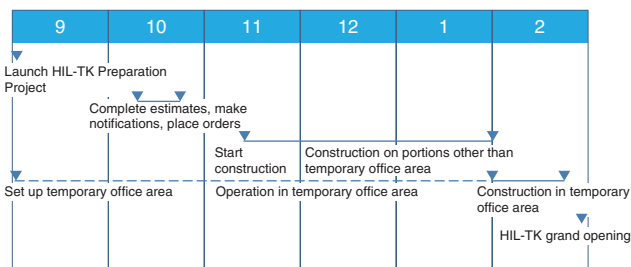


Fig. 4 Schedule leading to grand opening



Fig. 5 On-site study location before construction



Fig. 6 Same location after construction

This study and the confirmation of construction work were carried out by the following:

Regular meetings: meetings held once per week with design firms and construction contractors

Working groups: separate study meetings held once per week on IT systems, electric power, and furniture

Confirmation meetings: held as needed for on-site checking and confirmation of purchased furniture and prototypes

Conducting the study of specifications at the construction site allowed for immediate checking and confirmation of the layout, relative placement, and other aspects of furnishings and fixtures. This enabled decisions and actions to be taken on the spot. The result was that construction was successfully completed in an extremely short time. It was truly a case of putting into practice the Three Realities Principle of going to the actual place (genba), finding the actual source of the issue at hand (genbutsu), and basing your actual decision on reality (genjitsu).

2.6. Overall Layout of HIL-TK

As shown in Fig. 7, HIL-TK is divided into an entrance area, which is used for meetings with partners of collaboration and other such activities, and a work area, which is used for activities that require confidentiality management. Table 2 shows the features of each area.

Table 2 Entrance area and work area

Location	Name	Overview	Figure
Entrance area			
	East Meeting Room	Meeting room for about 10 people at windows on east side	Fig. 10
	Green Meeting Room	Meeting room for 10 people	Fig. 11
	Collaboration Room 1, 2	Rooms fit about 4 people each	Fig. 13
	Presentation Area	Space that can be enclosed in glass	Fig. 14
	East Cafe	Space usable for simple meetings and briefings	Fig. 9
Work area			
	Work desks	"Free address" trapezoidal desks open for use by all in the office and rectangular desks with assigned seats	Fig. 21, 22
	Central Cafe	Refreshment area located in central area	Fig. 36
	West Cafe	Refreshment area at northwest corner	Fig. 30
	High Counter	Free space along windows on north side	Fig. 23
	Sofa Seat	Free space along windows on north side	Fig. 24
	West Meeting Room	Meeting room for 12 people at windows on west	Fig. 26
	Small Meeting Room	Meeting rooms for about 6 people on west side	Fig. 26

3. Description of the Entrance Area

3.1. Entrance and Objects

The HIL-TK entrance doors shown in Fig. 1 are left open from 09:00 to 18:00 to signify open-mindedness. The first thing that visitors see at the entrance is the Honda R&D Innovation Lab Tokyo name plate. The wall facing that has a display area for objects that show what HIL-TK wants to

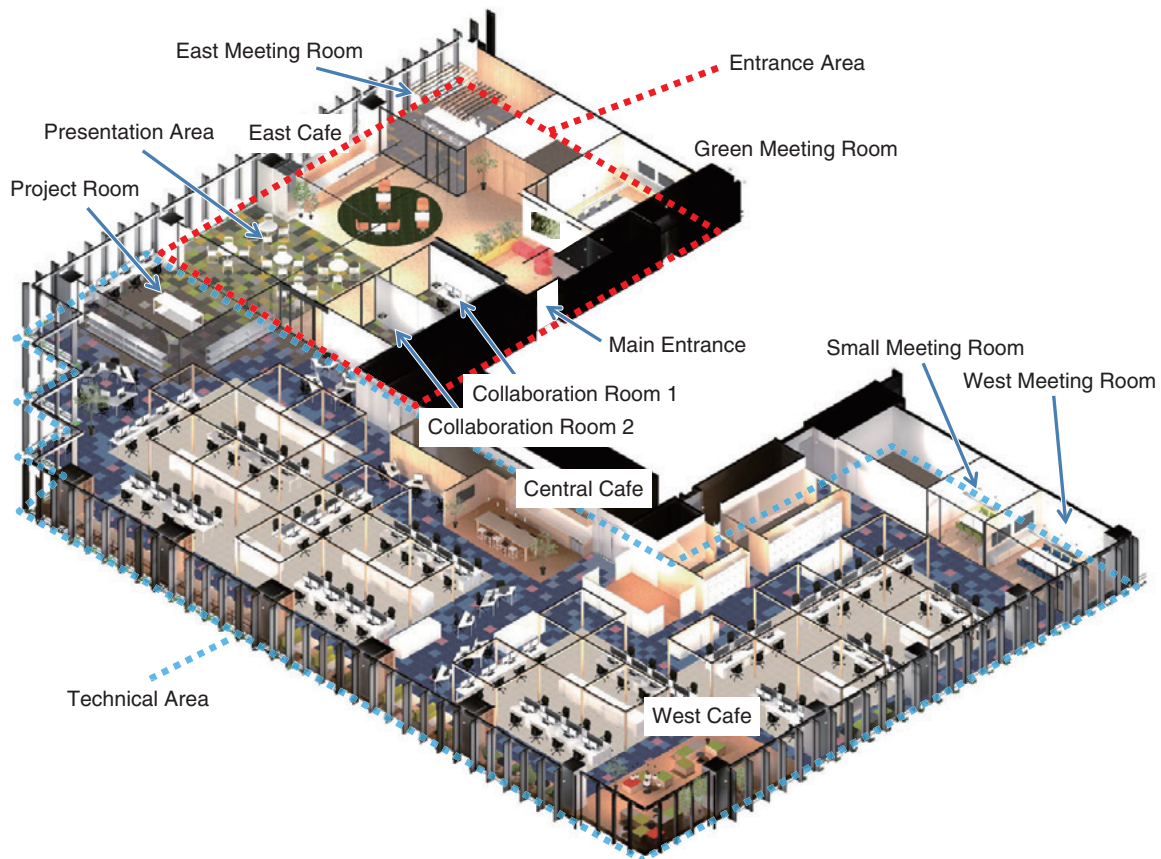


Fig. 7 Overall layout

achieve. This is shown in Fig. 8.

“Fake” objects are not used as substitutes for real things. The thinking is rather that the laboratory should seek to accomplish things that can only be embodied in something that is fake. These objects represent the determination to bring into existence and make available to society something that does not presently exist in the real world.

A photograph of a vineyard appears on the white wall along the far right. This expresses the will to create something that does not presently exist. A fake grape tree protrudes three-dimensionally with leaves and branches from the photograph. These signify the fake tree’s emergence into the real world. Finally, that grape tree bears fruit in the form of peaches, apples, and citruses, representing something that is not possible in the natural world.

3.2. East Cafe with Glowing Rings and Open Ceiling

Placed directly across from the entrance and facing it is a counter where refreshments can be prepared for visitors. This is called the East Cafe. The glowing rings are hung above it.

Looking down from HIL-TK, people have a view of the National Diet Building and the Imperial Palace. This view commonly makes people turn their thoughts to Japan’s future. That is something of great importance. Out of the desire to have people look even farther into the distance, however, HIL-TK has the glowing rings hung there to guide people’s gazes upward (Fig. 9).

This window faces eastward, so gazes guided upward from there look out over Tokyo Bay and beyond it, across the Pacific Ocean to Silicon Valley, then further across the United States and the Atlantic Ocean to Europe. Then from there, the view extends through India and China, circumnavigating the world. This outward gaze extending globally is the desired object. That is the intention embodied in this arrangement.

Part of the ceiling is open overhead, but this is not in

imitation of stylish shops. People are apt to think that their todays will continue into their tomorrows, and that no major changes will take place in the world around them. The ceiling is deliberately left open just in this area as a reminder that what people generally expect to find - i.e., a ceiling overhead - suddenly may not be there anymore. It is a hint to be aware that there is no knowing what will happen tomorrow.

3.3. Meeting Rooms

The meeting room walls are white and made so that magnets can stick to them. All of these walls can be used as white boards. The idea for this came from an episode in the life of the company founder Soichiro Honda, who was so engrossed in discussion one time that he made a drawing that extended right onto the floor. The point here was to create an environment that makes it easy to pursue a discussion at any time.

The partition between Collaboration Rooms 1 and 2 was made movable, so that the two rooms could be used as one. These rooms were given this name because they were envisioned as generally being occupied by creators and



Fig. 9 East Cafe with glowing rings and open ceiling



Fig. 8 Objects in entrance



Fig. 10 East Meeting Room

researchers from outside the company who had come to collaborate on projects here.

3.4. Glass Partitions

The laboratory is a place where Honda members can work at the boundary between the company and the outside world, so they can pick up direct impressions of what is happening in society. There they can sense the things that do not yet exist, that people are seeking deep in their hearts. They can realize that these are the things people want, and create them in order to bring wonder and joy to those people. This is not an effort that Honda members can pursue on their own. It depends on an open-minded, creative collaboration with people outside the company. As an expression of this open-mindedness, therefore, even the walls that mark off the border between the work area for HIL-TK personnel and the area where visitors can enter freely are made transparent. As shown in Fig. 12, the seats in the work area are clearly visible through these walls.

While there are work matters that personnel have to be careful about keeping out of view, because of possible concerns that something might be seen and copied by outsiders, and these personnel have been more concerned

about it than anyone, there is no reason to think that a passing glimpse of their work will result in the competition taking the lead over Honda. If the competition takes the lead in something, it is because the people whose work was glimpsed were moving too slowly. This approach also amounts to an expression of the determination at HIL-TK to reconsider former ways of working and, because the open approach is being adopted, to move forward and work at a blazing pace.

3.5. Upside-Down Graphics

The doors and walls of meeting rooms within HIL-TK are also made with transparent glass.

This does not mean, however, that people in a meeting will not feel uncomfortable if they are completely visible from the outside. In order to reduce that feeling of being exposed, graphics have been worked into the glass at an eyesight level.

However, these are not just to block the view. In order to suggest the importance of looking at things from various different perspectives, the graphics show a map of the world with the usual top and bottom reversed, together with a map that has the North Pole at the center (Fig. 13).

3.6. Presentation Area

This is a space for holding special events. Ordinarily it is used as a place for holding meetings, but the area can be surrounded with movable glass walls and the window can have curtains closed, or screens lowered over it, to create an area suitable for holding presentations with a projector. The area can seat 20 people around round tables or 35 people when chairs are placed without tables. If the movable glass walls are taken away, an event for 100 people can be held. At the HIL-TK grand opening held on February 28, 2017, this area was used to hold a press conference for invited mass media and journalists. Figure 14 shows a lecture being given by Prof. Edward Albert Feigenbaum, the noted authority on AI expert systems, who was invited to speak.



Fig. 11 Green Meeting Room



Fig. 12 Transparent glass wall



Fig. 13 Graphics on walls of Collaboration Rooms 1 and 2



Fig. 14 Scene of a talk being given in the presentation area

4. Description of the Work Area

The work area has no doors installed except for the two meeting rooms and the project room. This is done partly to encourage exchange among HIL-TK personnel by making it easy to look across the area and see where people are. It is also to provide for good circulation throughout an organization that is not primarily hierarchical.

4.1. Work Area Specifications

Wooden flooring can make an area noisy from people's footsteps and from the reverberations of people's conversations. It can also necessitate major replacement work when the flooring needs maintenance. The floor in the work area was therefore carpeted.

The use of highly sound-absorbent carpet enables laboratory personnel to talk freely without worrying about the noise. The buzz of people in discussion also generates an appropriate acoustic environment that allows people to communicate openly in a space that feels as unconstrained as walking through a forest. Out of consideration for when the carpet may become terribly soiled, it is installed in squares that are 50 cm on each side, as visible in Fig. 15, to allow easy replacement. This is also a measure intended to reduce future maintenance expenses.

Sidebar: A Story of People Who Take on Challenges

An initiative to build up a new world may seem overly bold.

If existing research centers up to now are likened to luxury ocean liners, then HIL-TK is nothing but a little rowboat. That boat, however, belongs to people who are taking on the challenge of heading out onto the vast blue sea of new business.

The ocean is the source of life, and on it these people

may reach uninhabited islands where trees grow, branches extend outward, vegetation flourishes, and flowers bloom. There, the people build houses for themselves out of driftwood they find on the beach.

This kind of story was used to configure the materials and colors of the work area. The passageways are carpeted in blue, representing the ocean. The places where personnel do their work are colored ivory, representing the beach.

4.2. Project Room

HIL-TK does not provide spaces for displaying past research results or products. This project room is a laboratory for products that are going to be supplied to the world. In other words, these are things that will become the legacy of the future, and this research and development work is carried on in a space placed deliberately to be visible to visitors.

It should be apparent from Fig. 16 that there is nothing to block off this room from the entrance area. There is a wall of transparent glass through which people can see into the work area on the other side. This is another place that is formed by the HIL-TK philosophy of openness and innovation. There is also an anticipation that having people



Fig. 15 Work area scene



Fig. 16 Project room viewed from the reception area

from outside the company see experimentation being carried on will serve to stimulate the formation of ideas that bring further development.

4.3. Smart Frame

Boundaries made up of wood pillars and called smart frames were installed around the work areas. These allowed the areas to be freely divided into separate spaces. Inside the boundary is a region where people can immerse themselves fully in their work. Outside the boundary is a region where people can move and do different things for a change of pace. By making these kinds of sensory demarcations of spaces, a sense of team unity is generated. As can also be seen in Fig. 17, the smart frame pillars are of uniform height and have conspicuous grain. Having the pillars lined up directs people's gaze away from the low ceilings, and this was another intended effect.

The smart frame has steel beam as the structural material covered with a veneer. The surface is covered with a resin coating in order to give the feel of genuine wood while keeping soiling to as low a level as practical. Envisioning that desk positions will be moved to keep up with changes in work, the smart frame is constructed as a Rahmen structure with a rigid frame that is not fixed to the floor. This allows easy extension or removal of the frames in single units composed of three-meter spans.

4.4. Dokodemo White Board

A lightweight frame weighing 5 kg was devised to which a white board can be freely attached, with magnets, at any height. This allows white boards to be attached easily at any part of the smart frame. At HIL-TK, this is called the Dokodemo White Board. This realizes a space where discussion can be carried on while making notes anywhere within the area.

4.5. Discussion Wagons

Discussion wagons were placed to the sides of the seats. These are work platforms equipped with storage

space. The surface is made of melamine resin, which is slightly rough to the touch but withstands somewhat rough handling without being damaged. This means that people can feel free to use the wagons as work platforms without restraint. The wagons are built with the capability to meet the laboratory's changing needs, and have casters attached to make them easy to move. The tabletop was set at a height that allows people to work at a computer while standing, or to gather around the wagon for a meeting. In order that people will not have to pay attention to any extraneous concerns during discussion, the drawers are made without any protruding parts that clothing might catch on. A space that toes will fit under was added around the bottom of the wagon to avoid the discomfort of stubbed toes. Many prototypes were made and discussions held around them in order to work out the distance between people facing each other across the wagon, to decide the storage capacity and external dimensions, to determine the shape of handgrips on the drawers, and so on, so as to encourage vigorous discussion. The result was a collaborative work that achieved a fusion of architectural design, which mainly involves looking at objects from a distance, and automobile design, which involves a more close-up handling of objects.



Fig. 18 Dokodemo-white board



Fig. 17 Smart frame



Fig. 19 Discussion wagons

The layout is configured to enable concentration with a sense of speed. If people are facing their desk and working on programming, for instance, they can turn right around to reach for something, to do something, or to discuss something without having to break their chain of thought. This may be why it is not unusual to see people gathered around a discussion wagon holding a meeting even though a meeting room is open for their use.

4.6. Desks

It is common at HIL-TK for people to use two computer displays and to have more than one computer close at feet, so that desks need to have enough width from side to side. People also want desk construction to include places where wiring, power adapters, and so on can simply be fitted in from above, leaving the desk surface uncluttered. However, commercially available desks have hidden wire management grommets with such narrow space that people would get their fingers pinched. It also proved not to be easy to find desks that were easy to use and also had a high-quality feeling. The upshot was that HIL-TK had matching



Fig. 20 Meeting scene taking place around discussion wagons

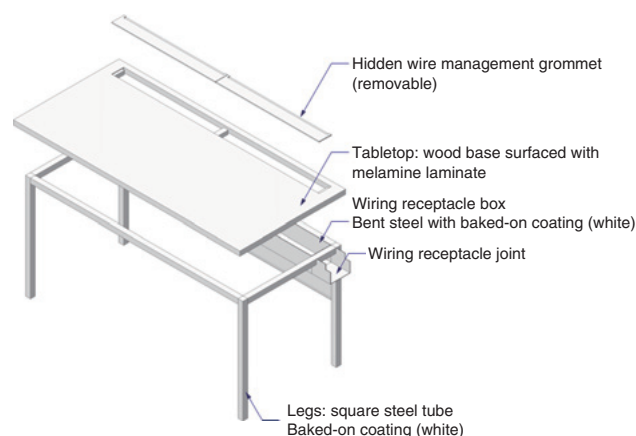


Fig. 21 Schematic drawing of desk

desks built both for meeting rooms and work areas, taking care with the shape of the hidden wire management grommets, providing enough clearance, rounding the edges, and so on. Coloring was kept to a bare minimum in order to facilitate concentration on work. Since computers and their displays are mostly black, the chairs were also made black while the desks were made white to create a bright, cheerful atmosphere. The same material with an identical thickness was also used for the discussion wagon tabletops placed around the work areas, and the Dokodemo White Boards were unified by use of the same white color as well. Efforts were made to help avoid flooding the area with a profusion of different colors.

On the other hand, the desks built for work done by planning divisions and supervisory personnel, which can be handled using a single notebook computer, are configured in a trapezoidal shape. This removes those parts of the desktop where people's hands will not reach and therefore keeps the working surface from becoming cluttered with things.

These trapezoidal desks can be placed singly, but as shown in Fig. 7, three can be placed together to form a half-moon shape or they can be placed in other of numerous different layouts. The desks in HIL-TK, including those in the meeting rooms, were made with common specifications for hidden wire management grommets and tabletops as a measure to reduce the fabrication cost.

4.7. Free Address Area

The area facing the northern windows was designated a free space. This was set up as a place where personnel could switch into a different frame of mind. It is furnished with high counters and colorful seats of easily adjustable heights. A privacy panel is placed so that people sitting there will

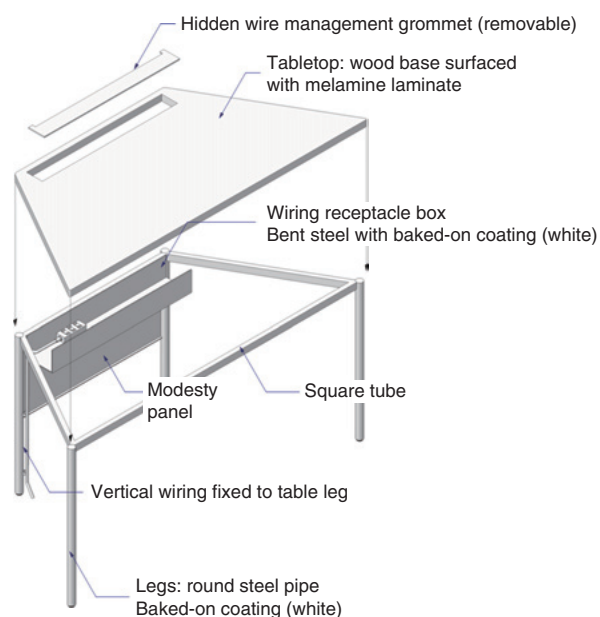


Fig. 22 Schematic drawing of trapezoidal desk

have their bodies, from the knees down screened from view from outside the windows. The far edge of the counter is also given a raised rim so that pens or other objects cannot fall off in front of the windows. Pains were taken to make these and other such arrangements so that people will be able to immerse themselves fully in their work without having to think about extraneous matters.

The area next to the high counter is furnished with sofa seats. The area beside the windows is a free space where people can hold discussions in an atmosphere of calm. It is for meetings and for refreshment, and it is rare to find an open seat. The space under the seat allows for storage of water bottles for disaster readiness, like the colorful stools to be described later. This also contributes to the effective use of space.

4.8. Honda's Bookshelves

The five large columns at the windows in the north area have bookshelves installed around them.

Books are made with words that have been sifted through the gaze of their authors and editors, and when perusing them, there is something good about being able to naturally read the passages around the parts one wanted

to find out about, as well. For research and development, books have been collected that are accumulations of knowledge on themes relating to forms in communication, the body and food, nature and people, culture and aesthetics spanning the past and the future, and other subjects not typically seen as part of research and development. Among them are books that can be considered historic works, such as the Whole Earth Catalog, various paperbacks on current topics, large format books, comic books, picture books, and photographic anthologies. "Honda's bookshelves" contain 600 or more volumes as a device to inspire new ideas by the fortuitous stimulation of reading or browsing.

4.9. Meeting Rooms for HIL-TK Personnel

The West Meeting Room is located by the windows on the west side, far from the entrance area. The Small Meeting Room is located beside it. (In Fig. 26, the right side is toward the west.) The seats in the Small Meeting Room are orange in color, and in the West Meeting Room they are light green. The color scheme was made light and cheerful to encourage active discussion.

The glass in these two meeting rooms contains representations of the history of tools. This is to show



Fig. 23 High counter



Fig. 25 Bookshelves

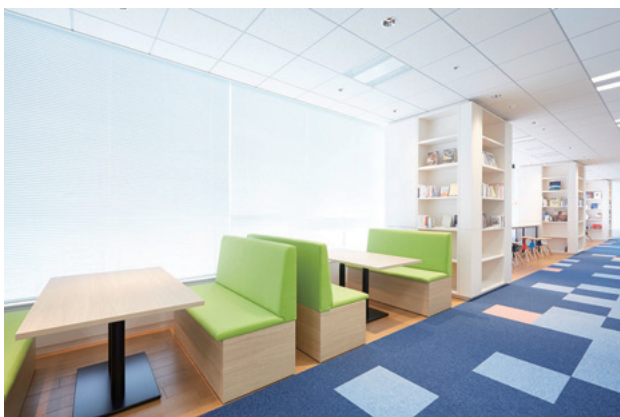


Fig. 24 Sofa seats



Fig. 26 Small Meeting Room and West Meeting Room

respect to the things created by people of preceding generations, as well as in hopes of stimulating inspiration in the people working here (Fig. 27).

A stone tool is placed at the far left as the oldest category of tool made by humankind. This stone tool was discovered through the persistent efforts of a lone individual at a location later designated the Iwajuku archaeological site. This is one of the stone tools in the collection of the Aizawa Tadahiro Memorial House that rewrote the archaeology textbooks⁽⁵⁾. This artifact is etched first in order to make the point that HIL-TK personnel are called on to take up challenges even against what is accepted as common sense, without being constrained by common knowledge, academic institutions, or established theories.

Cooking over an open flame can be extremely challenging, since the surface of the food may be charred while the inside is still raw. If water placed in an earthenware container is used to boil the food, however, the temperature will not rise above 100°C. All that is necessary is to control how long the food is boiled, so cooking becomes extremely simple. An earthenware vessel was therefore etched into second place as a tool that can be considered to have brought about a revolution in cooking.

When people are conveying information, the spoken language they use will disappear when those speakers are gone. When people mediate the communication, the information tends to degenerate. Written letters can record communication accurately, and are, in a sense a tool that can transcend time. Therefore written letters are shown as tools in the third place, and in this case the letters are Egyptian hieroglyphics representing intelligence.

Printing technology expanded the propagation of knowledge from just some people to the public at large, and mass printed matter enabled information to be conveyed all around the world. This was an information revolution during the Renaissance that is comparable to the internet today. Printing type is therefore etched in the fourth place

as a tool that transcends space.

Prof. Edward Albert Feigenbaum, who kindly agreed to serve as an advisor to R&D Center X, is also a fellow of the Computer History Museum in Silicon Valley. This museum has an abacus on display as an early calculating device. In the fifth place, therefore, an abacus is etched as a tool for making calculations.

When a tool for making calculations and a tool for making records information are combined, or in other words, when logic elements and memory are combined, what they make is a computer or artificial intelligence. What is shown in the sixth place, therefore, is a conceptual image of artificial intelligence.

The last thing to be etched in this series is a question mark. The expectation is that as people enter and leave these meeting rooms, they will consciously wonder, every time, what they themselves should make to follow after the revolutionary tools created by preceding generations.

4.10. Colorful Stools

Colorful stools have been placed in the West Cafe and in front of the objects at the entrance, among other locations. It takes more than any ordinary effort to fulfill an intention to bring to reality something that does not presently exist or cannot possibly exist. People who attempt it may have to go through uncountable numbers of unsuccessful attempts along the way. It seemed preferable to have a bright, cheery atmosphere in which to face up against challenges of that kind, so stools upholstered with colorful fabric have been placed here and there.

A further functionality is built into these stools. HIL-TK has laid up three days' worth of water and provisions in readiness for a disaster period when some personnel may be unable to travel back to their homes. The water alone amounts to approximately 1.5 tons, so finding a place to store it is a major task. It was decided, therefore, to store water inside the stools in bottles for use in water dispensers. Products like this were not conveniently available on the market, so these too were built for that purpose.

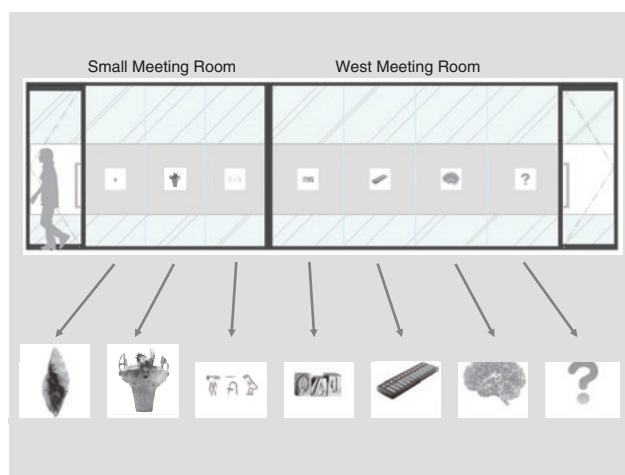


Fig. 27 Stone tools, earthenware, hieroglyphics, printing type, abacus, AI, ?



Fig. 28 Water bottle being replaced

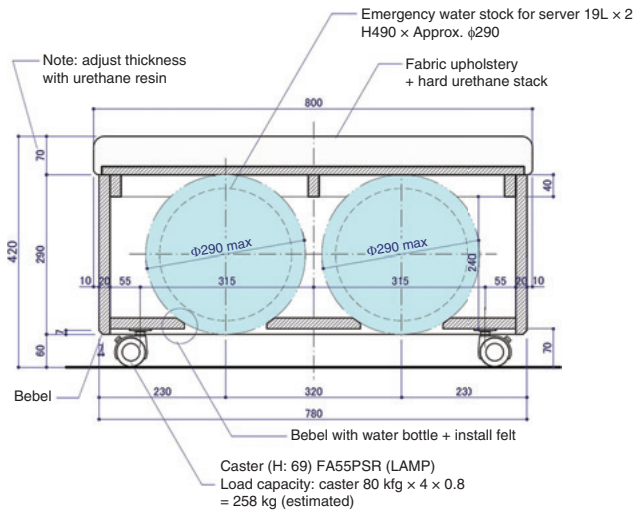
The following specifications were set for the stools:

- (1) Seat surface height at a level suitable for relaxed sitting
- (2) Thickly cushioned seat for comfortable sitting
- (3) Bright colors to induce cheerful feelings
- (4) Casters for ease in moving
- (5) Construction that allows for ease in placing and removing stored water bottles
- (6) Construction that does not damage the surface of stored water bottles

The stools store water bottles that are 290 mm in diameter, and the seat height was kept to 420 mm to allow for comfortable sitting. Not only do the stools in their four colors (blue, green, orange, and yellow) make for an effective use of space, they also serve as a visible reminder that heightens the awareness of disaster preparedness.

4.11. West Cafe

From the northwest corner, there are sweeping views of the State Guest House and the greenery of the Akasaka



Source: NOMURA Co., Ltd., design drawings for Honda R&D Innovation Lab Tokyo

Fig. 29 Stool structure

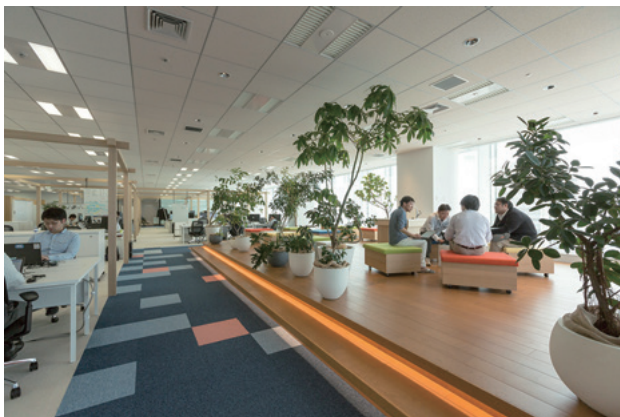


Fig. 30 Meeting scene in West Cafe

Imperial property. This corner was made into a cafe, with plants placed in connection with the green from the outside view, the floor raised, and numerous colorful stools placed around it.

This area was designed for refreshment and relaxation, but the fact is that personnel can often be seen holding meetings here. In an unforeseen but fortunate use, the cafe spontaneously became a place to hold meetings, taking advantage of the open, relaxed atmosphere which is unlike the meeting rooms.

Sidebar: Pay Attention to the Professional's Technique

Designers produce appealing-looking drawings. Even where a real room is cramped, perspective drawings can make it look like an expansive, roomy space. This is the kind of work only professionals can do. The reaction when a person sees the actual place is disappointment: "How can it be this cramped in here?" Figure 32 shows a perspective view that makes the area look very spacious, but those who were conducting studies on-site would not be deceived. With the drawing in one hand and a strip of packing tape stretched across the floor, verification takes very little time. This is just the kind of thing that makes on-site study an



Fig. 31 West Cafe



Fig. 32 Perspective view of West Cafe

advantage.

As it happens, the photograph of the West Cafe taken by a professional photographer is also very appealing-looking. It is every bit the equal of the perspective drawing. Professionals have amazing skills.

4.12. Lighting

When people spend the whole day indoors under artificial lighting in a space without windows, there is a risk that their internal biological clocks will be affected. The control mechanism for this circadian rhythm is of great importance, as indicated by the fact that the Nobel Prize in Physiology or Medicine in 2017 was awarded for the elucidation of this mechanism⁽⁶⁾. The circadian rhythm is powerfully influenced by light. Working till late at night under strong white artificial light can make people restless after they get home, and it has also been pointed out that sleep disorders can be caused by this⁽⁷⁾. At HIL-TK, therefore, lighting that makes use of the changes in natural light was adopted.

Figures 33 to 35 show how the color of the lighting changes from daytime to evening to night.



Fig. 33 As seen in the daytime



Fig. 34 As seen in the evening

Wood-grained flooring material was used for the window frame on the north side and for the cafe floor, and the part of the ceiling near the window was given a reddish tinge. Then lighting with colored light bulbs was installed. Though this coloring is not noticeable under strong sunlight during the day, the dusk-like coloring is emphasized when the sun starts to go down. This allows people to gain a natural sense that the day is ending.

4.13. Central Cafe

This cafe was located next to the work space in an arrangement that clearly conveys which space is for concentration and which space is for relaxation. The cafe is an expansive space located on the other side of the carpet, which is colored blue as a conceptual image of water. By contrasting with the monotone coloring of the work space, the cafe uses the lighting of colored light bulbs and large amounts of wood to produce an atmosphere that naturally makes people want to stop in for a while. Given that HIL-TK is intended to create products that have a high-quality feel, items of solid wood were purchased for the desks and seats that personnel come into direct contact with. The cafe has become a favorite spot for meetings held with a change of mood.

A refrigerator, coffee maker, and tea dispenser are set out in this area. Sometimes people take breaks here, but the assumption is that personnel are also likely to go to the West Cafe to take their breaks while looking out at the view. It is anticipated that people will obtain something to drink here and then take the trouble to walk with their drink a few steps farther to that other spot where the intensities of work will recede and they can relax on a break, perhaps falling into a natural conversation with people they do not work with.

4.14. Hirameki Engine

As the deployment of AI in society shifts memory and analysis from people over onto AI, increasing value is likely to be placed on people as the originators of ideas. At



Fig. 35 As seen at night

HIL-TK, therefore, an experimental idea generation-support system called the Hirameki Engine has been installed in the Central Cafe on a trial basis. This is an arrangement in addition to the establishment of various free spaces and cafes where people can go for a refreshing change of pace.

It has been said that inspiration visits people on three things⁽⁸⁾. That is, it comes to people when they are riding on a horse, lying on a bed, or sitting on the toilet. This is explaining that the time when people are released from their concentration is when they can gain sudden insight. The idea is that the mechanism for inspiration takes the thoughts people have been having on a subject and the various concepts that people have in their heads, and then combines them in a random, unconscious way. It may be that only when the unconscious determines that this process has turned up a good idea does the inspiration rise up to consciousness⁽⁹⁾.

The Hirameki Engine is used by inputting one group of words that indicate matters which have been occupying a part of a person's attention. The engine then randomly throws up words that are unrelated to that group onto the display. This is a mechanism for obtaining clues for ideas from startling combinations that people would not think of for themselves that the engine puts together fortuitously. The unrelated concepts here are limited to things that people already have in their own heads or that they happen to see or hear while on a walk or on other such occasions, but the Hirameki Engine can isolate words randomly from across a broader range by performing internet searches. In this way, the engine broadens the range of the ideas. It is anticipated that people looking at the Hirameki Engine in the Central Cafe will be visited by sudden insights.



Fig. 36 Central Cafe and Hirameki Engine

5. Evaluation from Outside the Company

As described above, a variety of different measures were designed into HIL-TK, and ever since the grand opening, many requests to tour the facility have been sent in from

inside and outside Japan. Many visitors have been received at HIL-TK, including members of foreign embassies seeking to facilitate corporate collaboration, members of corporations and academic groups looking for information to use in planning new laboratories of their own, and so on.

HIL-TK was also honored with the 30th Nikkei New Office Promotion Award presented by the New Office Promotion Association. This came about because of a remark made by a person collaborating on the project from outside Honda. At a stage when the laboratory was nearly complete, this person said, "Since you've realized a space as splendid as this, you should consider applying for a design award." Thinking that if an application was to be made, then it might as well be for an authoritative award, and an application was made to the only national-level office-related awards program, supported by the Ministry of Economy, Trade and Industry and organized by the New Office Promotion Association. The judges gave very high ratings to the discussion wagons and other furniture as a fusion of architecture that is viewed and automobile design that is operated. They rated it so highly that they actually urged HIL-TK to market these items. The application therefore successfully resulted in receipt of the award.

The New Office Promotion Award is given on the basis of documentary review, and an additional on-site review by the head of an institute of architecture together with university professors and professors emeritus of architecture and design. These 12 experts spent an hour and a half conducting a rigorous investigation of HIL-TK. This is therefore a very high-quality award, and not something that can be obtained simply by seeking it. The judging is not based simply on the attractiveness of appearance, but examines such matters as whether or not the office gives the impression of providing the people who work there a comfortable environment that allows ample psychological breathing space, and whether the office incorporates innovative measures and arrangements to encourage ways of working that stimulate sensibilities and heighten creativity.

HIL-TK sees this award as an appreciation of how the aims of the people involved in the project have been realized.

6. Conclusion

HIL-TK was established in Akasaka for the purpose of product development in new fields related to artificial intelligence technology.

In an open-minded collaboration that involved people from inside and outside the company in the process of creation, a variety of different and innovative ideas were given form in HIL-TK. These include the objects that indicate directions to be taken with the new things created, stools that combine the function of storage space for water containers, smart frames used for the demarcation of spaces, Dokodemo White Boards, discussion wagons, Honda's

bookshelves, glass walls that encourage different ways of seeing things, displays of the history of tools that provide stimuli for thinking about what should be created, the Hirameki Engine that is an idea generation-support system, and so on.

As a result, HIL-TK received a New Office Promotion Award from the New Office Promotion Association.

Despite the short time allowed for construction, the project team composed of members from NOMURA Co., Ltd., Takachiho Products Co., Ltd., UNIVERSAL ENGEISHA Co., Ltd., at light laboratory, KAYAC Inc., and BACH Ltd., together with Honda personnel, engaged in exhaustive discussion to create something good. By making prototypes and repeatedly going through the process of confirmation, the team developed relationships of trust so that everyone involved was able to press the project forward not with the formalities of insiders and outsiders but on the first-name basis of people who can freely throw out their views and push each other to reach higher levels. This effort produced a space that evolved far beyond the concept envisioned at the start.

The image of what was achieved constitutes the first open innovation aimed for and executed by HIL-TK.

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