

Measurement of Human Behavior: Creating a Society for Discovering Opportunities

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OVERVIEW: Hitachi has undertaken research and development of leading-edge technologies able to perform continuous measurement of human behavior. Although “surveillance” is the image many people may bring to mind when they think of behavioral measurement, it is in fact a disruptive technology that helps people find new knowledge opportunities, grow, create, and manage their lives both at work and at life. The growing pace of change is being accompanied by many organizations that, although they can resolve the problems they confront, are unable to identify and take advantage of opportunities. Hitachi’s aim is to bring about a true knowledge-creating society by providing services it calls the “business microscope” and “life microscope.” These services enrich our lifestyles and encourage the generation of organizational vigor from the inside through technologies that support the measurement, analysis, and utilization of human behavior.

INTRODUCTION

WE are moving beyond the 20th century era of mass production and mass consumption and are beginning to seek out new society for the 21st century. The 20th century is characterized by Taylor’s scientific management and mechanization of production, which has established methodologies of “logical analysis” and “adoption of IT.”

However, the shift from “capital” to “knowledge” as the critical resource is showing up the limitations of past methodologies that relied on logical analysis. This is because true knowledge of people and organizations cannot be compartmentalized nor exchanged like goods.

“Measurement of human behavior” is about developing full intellectual capacity of society

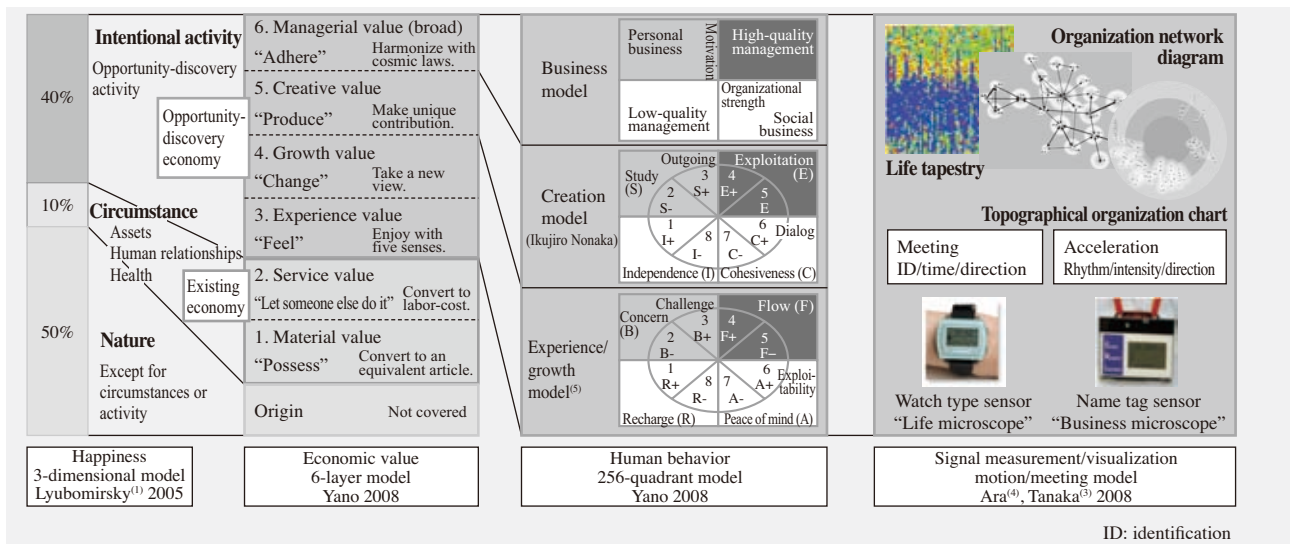


Fig. 1—Happiness and Economic Value Linked to Behavior Measurement by Human Behavior Models. Happiness for human beings is determined by three factors: their nature, circumstances, and intentional activities. Economic value is increased by adding the new values (called “opportunity discovery values”) of experience, growth, creation, and company management to the existing values of goods and services. This will open up a continent five times (50%) larger than the conventional economy which has been based on a circumstance factor of 10%.

through understanding the nature of man as a complete and undivided entity made up of both “mind” and “body.” This article introduces technologies for measuring human behavior and services for organizational transformation that utilize this technology. Hitachi has already applied these services to great effect in real organizations. This article describes these technologies for transforming from “problem resolution” to “identifying and taking advantage of opportunities” that can foster new growth in a wide range of different organizations in the future, and maps out their future potential.

OPPORTUNITY-DISCOVERY ECONOMY AND BEHAVIOR MEASUREMENT

Six-layer Model of Economic Value

For some people, the term “behavior measurement” may bring forth the image of a company monitoring its employees to ensure they are not slacking. However, both logic and managerial experience clearly tell us that this style of management will not improve productivity. Instead, “human behavior measurement” aims to deliver a completely different type of value.

At this point we will take a step back to consider what is meant by economic value. Value is reflected in things like profit, CSR (corporate social responsibility), and customer satisfaction. However, even if a company is profitable, in some companies this profitability is sustainable whereas in others it is at risk of changing to a loss. These changes will have underlying causes.

Since Socrates, Confucius, and Buddha were awakened to the meaning of “happiness” around 500 B.C., pursuit of the origin of value has always led back to the idea of “happiness.” Recently, the factors that determine happiness have become identified in “positive psychology,” a branch of psychology that, rather than aiming to treat illness, seeks instead to understand happiness in healthy people⁽¹⁾. When innate disposition is excluded, happiness is determined by two things: “circumstance” and “intentional activity” (see Fig. 1).

Of these, the surprising result is that “circumstance factors” such as wealth, power, fame, and health provide only 10% of the total influence.

“Intentional activity” in contrast, has an influence of 40%. “Intentional activity” means how we think and take action, and it is improved, for example, by performing a challenging task or thanking the people around us.

In the past, economic value has meant the benefits provided by goods and services. These were mainly associated with “circumstance factors.”

In the future, however, attention should be directed at the new economic values of an “opportunity-discovering economy” that are linked to intentional activities. These are the values of being able to discover opportunities at our own initiative and act to take advantage of these opportunities. These represent a “huge unexplored continent” that expands value five-fold in terms of its “happiness-equivalence.” Game consoles have already started to provide “growth value” by incorporating exercise.

Furthermore, at a higher level is “creative value” that accumulates growth and “management value” for sustaining this creativity. “Management” consists of the “threads that make up the fabric of life,” namely life, organization, and family. The behavior of the world can be explained using the six-layer model of economics.

The objectives of “human behavior measurement” are to make the actions customers take to “discover opportunity” more effective and to improve their “happiness.” This is achieved using behavior measurement and feedback. In the past, the value of goods could be ascertained through the exchange of items of equal value, and the value of services could be determined based on labor cost savings. The “value of discovering opportunities,” on the other hand, includes first-person factors and could not be measured. A whole new area is uncovered by measuring and modeling human behavior (see Fig. 1).

Business Microscope and Life Microscope

A conceptual leap occurs at the point where high-level values such as “experience” and “growth” are linked with low level behavior measurement in a “human activity model” (see Fig. 1). What makes this possible is Hitachi’s proposed “microscopes”⁽²⁾.

The significance of ultra-miniaturized computers is that they can be wearable. We have developed a very small wristwatch sensor (3.4 cc, 15 × 15 × 15 mm) with very low power consumption⁽³⁾. Called the “life microscope,” the sensor supports wireless communications and can measure acceleration and the wearer’s pulse for 24 hours and store the resulting data. Processing the signals produced by such sensors will capture the information latent in our lifestyles and can be used to improve our quality of life (see Fig. 1).

For organizations, Hitachi has developed “business microscope”⁽⁴⁾. This system uses sensors the size and shape of a name tag that transmit and receive infrared light to detect face-to-face interaction between people and track employee movement using accelerometers (see Fig. 1). This creates a trail of all activity within the organization from which previously hidden information can be extracted and utilized for the growth of the company and employees.

ORGANIZATIONAL PHYSICS

Human Activity Science

Hitachi has used these microscopes to collect over 30,000 person-days of activity data which constitutes one of the largest such database in the world. The collected data covers a very wide range of employees from presidents to new entrants in various situations including banks, sales, after-sales service, software development, research and development, hospitals, headquarters, and design departments in Japan, USA, and the EU (see Figs. 2 and 3).

Hitachi is proposing a new category of science called “organizational physics” that uses this vast quantity of human activity data for the study of human and societal behavior. To examine the meaning of this data in depth, Hitachi has constructed an organizational physics involving collaboration with leading authorities who are representative of the field. The work is making rapid progress (see Fig. 4).

The following sections explain organizational physics in terms of “organizational strength” and

“motivation” which provide two indices that can evaluate “management quality” from different perspectives (see Fig. 1).

Organizational Strength: Meaning Hidden in Triangular Relationships

The first key to management quality is organizational strength. This refers to the synergy effect whereby groups of people can achieve more than the sum of their numbers would indicate.

Although two people is the minimum size for an organization, the important issues for organizations start to emerge once three people are present. With three people, context and intention become more complex but the value of what they can produce is immediately increased.

Hitachi has verified this power of three people using the business microscope. This has shown that people who are surrounded by many “unbalanced triangles” in which one side of a triangular relationship is much weaker are less productive. The strength of these relationship links is determined by the frequency of face-to-face meetings. This conclusion is the result of a detailed study of 911 examples of IT (information technology) system implementation tasks collected by Massachusetts Institute of Technology (MIT) and Hitachi in

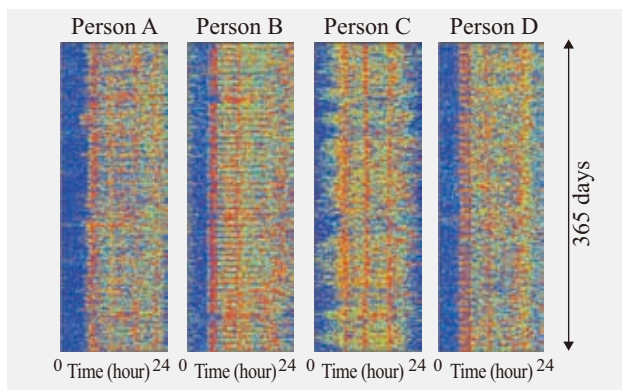


Fig. 2—Life Tapestry of Four People over One Year Obtained by Life Microscope. The life tapestries use color to show the frequencies of activity rhythms obtained from acceleration data. Red indicates activity at a higher frequency and blue indicates no activity or slow activity at lower frequency. The name “life tapestry” comes from how the subject’s life appears as a tapestry in these graphs.

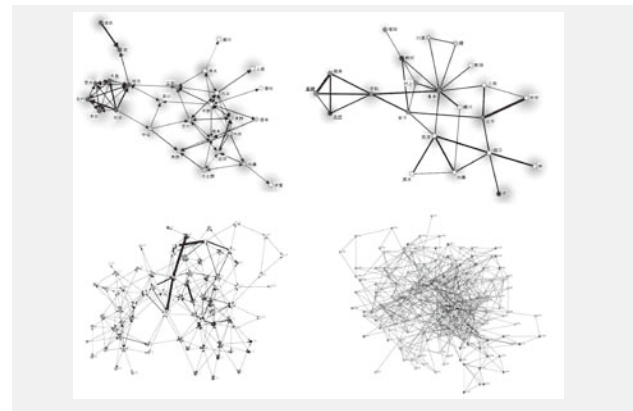


Fig. 3—Organization Network Diagram of Four Organizations Obtained by Business Microscope. The organization network diagram shows the relationships between people by recording meetings between them with infrared sensors attached to name tag sensors and normalizing the data over several weeks. People are shown as nodes and the node locations represent their relative position from the center of gravity of the organization. The names used in the diagram are aliases. The background colors behind the nodes for the two organizations shown in the upper half of the figure indicate people who often act in the pitcher’s role or catcher’s role in communication.

collaboration. In contrast, people surrounded by well-balanced triangles have high productivity.

Although one person in the triangle (X) can make an effort to engage in dialog with the other people (A and B), but there is nothing they can do directly to control whether A or B talk to each other. This is the core difficulty with triangular relationships.

Such unbalanced triangles can occur spontaneously without malice, when a person tries to follow the organization hierarchy or when a manager assigns clear divisions of responsibility, for example. Furthermore, the more unbalanced the triangle, the easier it is for X to control the situation by acting as a mediator. This may look like a favorable state of affairs but in fact it makes X the bottleneck in the team.

Organizations can make significant progress by taking note of such triangles and the business microscope supports this approach.

We hope you will allow us to introduce a personal experience at this point. One of the authors shares his home with his mother in law, and when he explained the theory of unbalanced triangles to his wife, she responded by saying “That is a great find. It is just like how I always find myself standing between you and my mother.” It seems he should be talking directly to his mother in law more often. Identifying these triangular relationships creates opportunities for significant growth.

Motivation: Flow

The second key business quality is whether employees enjoy the challenge of their work and treat it as an opportunity.

The “flow theory” from psychology is useful in this context⁽⁵⁾. In this theory suggested by Professor Mihaly Csikszentmihalyi, the term “flow” is used to indicate the state in which you are so engrossed in what you are doing that you lose track of time. This state increases productivity, means that the person is enjoying their work, and is a source of “satisfaction” (see Fig. 1).

To increase “flow,” it is necessary to match the challenge that is set with the person’s ability to perform the task and to find “flow” in the channel between “anxiety” and “boredom.” Managements that foster “flow” are those that encourage their employees to seek out challenging opportunities where they can make use of their skills.

The authors collaborated with Professor Mihaly Csikszentmihalyi to identify patterns of activity that are characteristic of the “flow” state. Using these results, they were able to quantify “flow” in employees and use it to measure management quality.

CREATING ORGANIZATIONS CAPABLE OF DISCOVERING OPPORTUNITIES

Organizational Change Service: Creating Enjoying Organizations

Hitachi High-Technologies Corporation has started a new business in April that uses the business microscope to offer services for motivating organizations and diagnosing their problems.

Recently, many organizations have consulted the company about revitalization. In particular, many organizations have taken passive measures in response to specific issues that succeeded in resolving the immediate problems that they faced, but yet have been unable to go beyond this and identify opportunities that could actually create value. A common feature of such organizations is weak horizontal links between people and a feeling within the organization of being “bossed around.” Another factor has been that the rise of e-mail has reduced the ability of people to interact directly. These are common issues faced by many different industries and companies.

What a person is capable of can vary by a factor of ten or more depending on whether or not they are motivated. Similarly, people can generate ten or

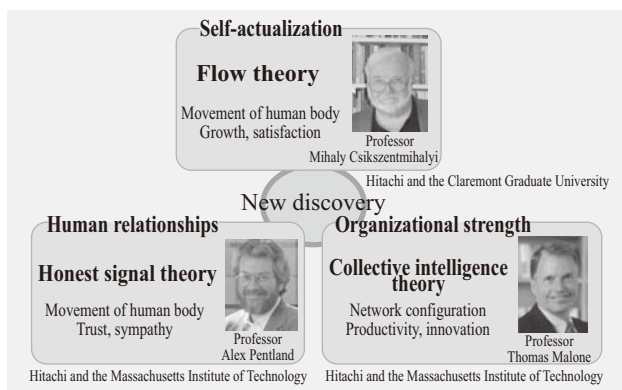


Fig. 4—Structure of Hitachi’s Collaborative Research in Organizational Physics. This research aims to identify the fundamental laws associated with self-actualization, human relationships, and organizational theory by utilizing large human behavior database containing information on over 30,000 person-days of activity. Hitachi invites leading authorities who are representative of the modern era to work with it on collaborative research. Organizational physics is developing rapidly.

more times the value when their relations with those around them are positive compared to when they are on their own. We use the expression “enjoyment of work” to indicate this situation in which we can perform our work in a way that makes maximum use of our capabilities and allows us to obtain synergies with those around us. Peter Ferdinand Drucker, the father of management, expresses this with the words “performing people enjoy what they’re doing.”

The difficulty here though is that these are things that cannot be seen or quantified. As a result they tend to get pushed back in the priority order behind quantifiable things like money. This is what is called the “brutal power of the measurable,” and the antidote is the business microscope.

Hitachi works systematically to increase opportunities for synergy and challenge in the workplace and offers an organizational change service that helps make this possible. The business microscope can be used to design the optimum teams and ideal network structure for an organization. Such an approach accomplishes more than even the most effective manager and the organizational strength that comes from the formation of teams will grow spontaneously (see Fig. 4). “Enjoyment” will manifest itself in company performance resulting in a virtuous circle that creates still more opportunity for enjoying work.

PRODUCING GLOBAL MIRROR AND KNOWLEDGE

Newborn babies are unable to recognize the image in a mirror as themselves. Instead, it is only through the process of growth that they come to equate their first-person awareness of themselves with that person in the mirror who appears as a third-person to others⁽⁶⁾.

Society, however, does not have a mirror and so is stuck in this infant stage. The “microscope” represents a planet-sized mirror and can change the way society sees itself.

Knowledge is not something that can be acquired like material things. Rather, knowledge is something we create for ourselves through our action and the stimulus we receive as feedback⁽⁷⁾. This inherent characteristic of “knowledge creation” was something that was identified in the philosophy of Confucius and Buddha. Confucius called this awareness of discovering opportunities “harmony but difference” and Buddha called it “dependent origination.” This requires one to empty one’s mind

and open up to the true potential of the current situation, a state of mind that is an undercurrent in Japanese culture and business practice. Hitachi’s one of establishing members Kumeo Baba called this “Empty yourself of selfishness and devote yourself to sincerity,” an idea that lies at the root of this research.

The idea of “scientific rationalism” represented by ideas such as the laws of perspective and the Copernican system grew out of the Renaissance and was based on classical Greek philosophy. This worldview, which has dominated the last 500 years, is now reaching a turning point and the idea that will lead the way for the next 500 years will be “behavior measurement.” What awaits us is a second Renaissance based on Oriental philosophy bringing a world in which a planet-sized mirror will provide consolidated knowledge of the human condition and a world in which individuals can act proactively to discover the rich opportunities available.

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