

Behavior Change Technology for Increasing Hybrid Work Productivity

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The COVID-19 pandemic has triggered a shift in working style of office workers from working in an office to hybrid work that includes teleworking. Amid such changes in the working environment, there is an urgent need to create a mechanism for improving productivity based on the characteristics of the office and teleworking environment. This article clarifies the workers' behaviors required to increase hybrid work productivity from the prospective of both reducing working hours and increasing performance, describes the behavior change technology to habituate these behaviors, and presents the technology's usage in an experiment involving the use of office stairs.

Current State of Japanese Office Workers

Japan's labor productivity (added value per employee) and engagement (willingness to serve an organization) are lower than in Western countries. According to survey results, labor productivity is 56% compared to the United States, and the ratio of enthusiastic workers is 6% of all workers (31% in the United States)^{1), 2)}. In particular, due to the impact of the COVID-19 pandemic in 2020, the working style of office workers has been semi-forced to shift to teleworking, and there have been complaints of health problems from stress and lack of exercise, and a decline in organizational strength caused by lack of communications.

Currently, as an evolving teleworking model, hybrid work that combines office and teleworking is attracting attention. The aim is to improve organizational productivity and worker satisfaction by reducing commuting costs and minimizing office space. However, to reach productivity levels on par with Western countries, it is necessary to reduce the working hours of each worker and at the same time increase performance (added value) by aggressively addressing the aforementioned health and communication issues.

Behaviors to Reduce Working Hours

In order to reduce working hours, preparing an environment that will allow workers to concentrate on work,

and reviewing the work processes to weed out wasted time are considered important. Among these, presenteeism and meetings are taken up as elements that can be dealt with at the behavioral level of workers and teams.

(1) Presenteeism

Presenteeism is a term that refers to a decrease in productivity at work due to health problems. According to estimates by the Ministry of Economy, Trade and Industry, out of the health-related annual productivity loss per employee totaling approximately 720,000 yen, about 560,000 yen is said to be attributed to presenteeism³⁾. The elimination of presenteeism requires prevention and remedy of locomotor/sensory, mental, and psychosomatic disorders. The following five behaviors are effective for that purpose⁴⁾.

- 1) Feel comfort (correct posture, feel comfortable with touch, air, light, sound, scent, and personal space)
- 2) Communicate (talk freely, greet others, laugh, show/accept gratitude, get to know your colleagues/company, work together)
- 3) Take breaks / change moods (eat/drink, chat, read newspapers, surf the Internet, listen to music, take naps, spend time alone, etc.)
- 4) Move your body (reduce sitting behavior, walk, use stairs, stretch, use health equipment)
- 5) Raise health awareness (view health information, check health condition)

(2) Meetings

According to a 2017-2018 survey, companies with about 10,000 employees spent 670,000 hours on wasteful meetings (equivalent to annual working hours for about 332 employees), and the loss for the companies reached 1.5 billion yen per year⁵⁾. With the widespread adoption of teleworking, the number of meetings per day is increasing due to reduced travel times such as for commuting. However, unlike face-to-face meetings, it is difficult to convey non-verbal information (eye contact and gestures) during teleconferences. As a result, communication with a

high level of psychological safety (team relationship where each member feels relaxed and even expose weaknesses) cannot be achieved and consensus of meeting participants on decisive matters cannot be reached.

Regardless of whether the meetings are held face-to-face or remotely, in order to reach decisions that everyone can agree upon within a given time, smooth communication behaviors leading to consensus building and mutual understanding that is in line with facilitation techniques are required.

Behaviors to Increase Performance

In 2012, a large-scale project was conducted to study the success factors of high-performance teams⁶⁾. The study revealed that to achieve high performance, the ability levels exhibited by team cooperation (collective intelligence) is important rather than the abilities of individual team members. The greatest success factor that enhances this is the psychological safety mentioned previously. To ensure psychological safety, it is necessary to (1) provide equal opportunities to speak, (2) read emotions and feelings of others and understand the effects of one's own remarks on others, and (3) speak and behave in a manner that shows sense of safety.

In the 'Core Theory of Success' advocated by Daniel Kim⁷⁾, when trusted relationship is built up in the team (quality of relationship), the workers' thinking changes positively (quality of thinking), spontaneous challenge behavior is born (quality of behavior), and high performance is achieved (quality of performance). This further enhances the quality of relationship. The quality of relationship is the most important key to the theory of success, and that precisely corresponds with psychological safety.

On the other hand, from the perspective of creating new added value, the SECI model has been devised as a knowledge management framework suitable for innovation⁸⁾. In this model, individuals' knowledge and experience that is tacit knowledge (knowledge that is difficult to verbalize) is shared with others and visualized as explicit knowledge (verbalized knowledge), and by coupling these together, new explicit knowledge is created. For sharing tacit knowledge, casual communication between people with different tacit knowledge is effective, and it is desirable for the communication to take place at a real location rather than online.

In a related study investigating the impact of communication within a company on productivity, mediation centrality (ease of mediating from person to

person) rather than degree centrality (number of people to interact with) has been shown to impact the company's performance⁹⁾. This suggests that to increase performance, it is more important to actively obtain the right information from the right people than to simply have a large number of employees communicating with each other.

Summarizing the above, in a human network consisting of colleagues in the same workplace or project, highly psychologically safe exchange behavior that makes one feel comfortable to even expose weaknesses enhances the sense of unity of the team and increases performance. For a human network consisting of a few acquaintances and acquaintances of acquaintances, serendipitous encounters centered on a real place where conversation can be light-heartedly exchanged provides an opportunity for innovative value creation and help increase performance.

Behaviors of workers that help improve the productivity of an organization have been clarified thus far (**Figure 1**). In the teleworking environment, information transmission is limited to the Internet and telephone, which tends to be disadvantageous when prompting behaviors that increase the productivity of workers. Therefore, it is desirable to actively utilize the space, equipment, and information systems in the office environment to improve the behavior of workers in hybrid work.

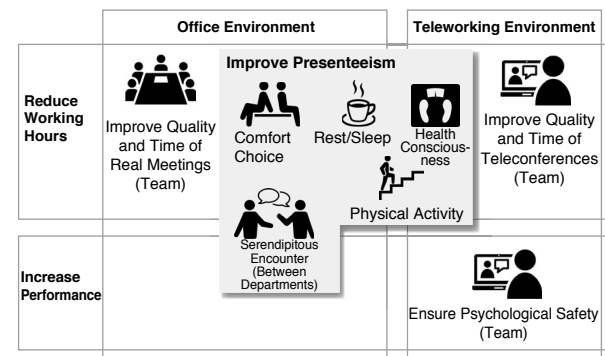


Figure 1. Productivity Improvement through Worker Behavior

Improvement through Behavior Change Technology

OKI has been aiming to expand into the healthcare business¹⁰⁾, and in the process has been working on behavior change technology that changes human behavior for the better based on behavioral science¹¹⁾. The goal

of the technology is to habituate behavior by providing timely triggers and feedback according to the individual's situation. It can be applied to the behaviors of workers shown in **Figure 1** to improve the productivity of an organization.

The behavior change technology will be introduced using an example in which presenteeism is improved and productivity is increased by moving the body around in an office environment. The principles of the technology are shown in **Figure 2**.

(1) Behavior Trigger

It is known that a behavior is likely to occur when motivation, ability, and trigger conditions are matched¹². Motivation is the degree of enthusiasm for a behavior, and ability is the degree of ease for a behavior in terms of physical, intellectual and environmental (time, money, place, weather, etc.) abilities. Trigger is the signal to execute a behavior.

Behavior change technology collects an individual's attributes, behaviors and environmental data, and estimates the motivation and ability of each behavior. Then, based on motivation and ability, candidates for specific behavior of appropriate difficulty are derived to match the psychological state of an individual to want to accept and challenge. Afterwards, it waits until a situation suitable for executing the behavior occurs and push-delivers a trigger message to the individual's terminal.

Taking the stair usage as an example, a person's motivation and ability for the behavior are estimated from the frequency of stair usage during office work and the history of the number of steps used. That information is used to derive a behavior that is slightly more difficult than the person's ability. For instance, if the stairs are used twice daily to go up and down three floors, the behavior "go up and down four floors twice a day" is derived. Later, when a situation is detected in which that person is in the elevator hall and the elevator is crowded, information that triggers the use of the stairs is delivered to the person's terminal.

(2) Behavior Feedback

There is a known learning mechanism where feedback that causes comfort immediately after a behavior releases chemical substances such as dopamine into the brain and strengthens the neural circuit. As a result, the frequency of the behavior's occurrence increases (enhancement). Conversely, the frequency of the behavior's occurrence decreases (erasure) when there is no feedback¹³. In the five behavior change stages from the state of indifference to that of habituated behavior, extrinsic motivation

(financial incentives, evaluation from others, coercion, etc.) is effective in the initial stages, whereas intrinsic motivation (enjoyment, sense of accomplishment, altruism, etc.) is effective in the latter¹⁴.

In behavior change technology, when a desirable behavior is detected, a feedback message according to the behavior change stage is immediately push-delivered to the person's terminal.

For example, in the stair usage behavior, if the behavior change stage is low at the time when the stair use ends, extrinsic motivation such as "points and lottery equivalent to financial incentives" is delivered to the person's terminal. However, if the behavior change stage is high, intrinsic motivation such as "contribution to the global environment by avoiding the use of elevators" is delivered.

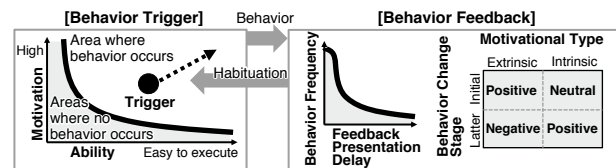


Figure 2. Principles of Behavior Change Technology

(3) Techniques to Realize Behavior Change

People sometimes make irrational choices based on intuition and beliefs. Techniques that skillfully utilize this to change human behavior are known as nudge¹⁵ and "Shikake"¹⁶ (an embodied trigger). Behavior change technology incorporates these techniques as intervention contents for behavior triggers and feedbacks.

For example, when the cumulative number of steps climbed on the stairs approaches a nice round value such as 10,000 steps, the situation is visualized and push-delivered. This invokes a psychological tendency to want to complete unfinished work (Zeigarnik effect) and triggers a behavior.

On the other hand, in the behavior change stage model¹⁷, intervention techniques suitable for the behavior change stage are systematized. For instance, during the initial stages of behavior change, it is effective to make people feel that their current behavior is "bad" and understand the merits of changing behavior, whereas in the latter stages, it is effective to make people aware of the specific behavior methods. Therefore, in the behavior change technology, knowledge about the target behavior and tips of behavior change are delivered at an appropriate time according to the behavior change stage.

Figure 3 shows an example of applying the behavior change technology to promote the use of stairs in the office

and promote interaction between workers. In promoting the use of stairs, the spatial information of the office is used to provide workers with timely behavior triggers and feedbacks to prompt the improvement of presenteeism. In promoting interaction, it detects the deterioration of teamwork due to teleworking, induces workers to come to the office, and improves the psychological safety of the team by revitalizing casual conversations in the office.

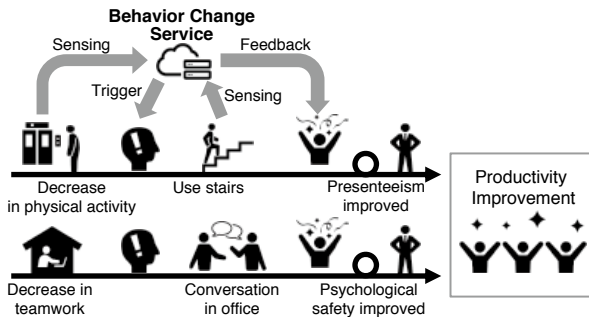


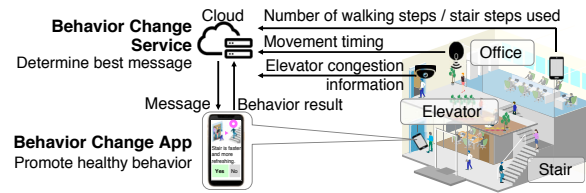
Figure 3. Application Example of Behavior Change Technology

Examples of Motivation and Habituation (Experiment to Promote Use of Stairs)

Using behavior change technology, an experiment was conducted to promote the use of stairs in an office building¹⁸⁾. The experimental system collected worker behavior information into the cloud from sensors and cameras placed in the stairs, passageways, and elevator halls of the building, as well as from built-in sensors of smartphones carried by the workers. Then, according to the status of worker’s behavior, the system delivered messages that induce healthy behavior such as the use of stairs to the smartphones in a timely manner.

After conducting the experiment at the office building of Kajima Corporation from March to April 2021, the number of workers (those whose behavior change stage belonged to the latter stages) who use the stairs increased about 40% compared to before the experiment. Additionally, over 60% of the subjects were more health conscious after the experiment, and the numerical value (self-efficacy) indicating the motivation to continue stair use improved. The experiment has demonstrated that the technology provides a certain effect on habituation and motivation of healthy behavior.

Experimental Configuration



Change in Behavior Change Stage (Questionnaire, Number of Valid Respondents: 40)

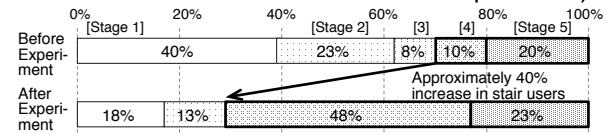


Figure 4. Configuration and Results of Stair Use Experiment

Conclusion

In an effort to bring behavior change services that support productivity improvement of hybrid work to fruition, OKI will make technical improvements to enhance the suitability of intervention content for individual workers.

Furthermore, since the use of behavior change technology is expected to change people’s consciousness and behavior spanning a wide range of behavior change stages of various behaviors, OKI is considering the technology deployment not only in the healthcare field but also in other fields such as climate change. Embracing the voices of people who say, “I know, but I can’t do it, I can’t continue,” OKI and partner companies aim to conduct large-scale demonstration experiments to realize more accurate behavior change services.

Acknowledgment

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TIPO [Glossary]

SECI model

Systematization of the knowledge creation process in an organization. It consists of four processes: Socialization, Externalization, Combination, and Internalization.