



Challenges and Prospects for Cloud-Based Enterprise Systems in Tradition-Focused Cultures: A Design Thinking Case Study

Artem Levchenko¹(✉)  and Victor Taratukhin² 

¹ Voronezh State University, Voronezh, Russia
artem.levchenko@sap.com

² Germany and Higher School of Economics, University of Muenster, Muenster, Russia

Abstract. Cloud-based enterprise systems, a growing segment in the global market for enterprise IT solutions, have met with strong resistance in traditions-focused cultures such as Japan's. Low cloud concept utilization has caused difficulties during the coronavirus pandemic, as remote work was not always technically possible due to the limitations of on-premises solutions. Our work applied Design Thinking methodology to form a foundation stone upon which cloud providers may build a Cloud Mindset in Japan and similar markets. This article considers both the endogenous agility that SaaS can engender with organisations and the exogenous possibilities that it brings about in terms of connections with other organisations. It describes the case study and covers six phases, from understanding the problem to testing a prototype of the solution. The research aims to act as a practical inquiry into the appliance of Design Thinking methodology in the new, challenging field of building Cloud Mindsets in multi-language environments. Consideration of the cultural semiosphere forms a necessary element of the research. The scientific achievement of this work is to make useful modifications to the classical methodology in this field. The practical value of the work lies in its applications for cloud providers in countries with similar cultural aspects to Japan.

Keywords: Cloud-bases enterprise systems · Cloud mindset · SaaS · Design thinking · Creativity

1 Introduction

Enterprise systems are essential for business in the twenty-first century. Ongoing technological progress provides new IT models such as the Internet of Things, blockchain, on-live analytics, machine learning, and cloud. All of these have proven their value for business over recent years.

Cloud technologies offer an opportunity for enterprise systems to use IaaS (Infrastructure as a Service), PaaS (Platform as a Service), and SaaS (Software as a Service) models. On the one hand, it reduces time-to-value metrics, avoids infrastructural expenses, operational and maintenance costs, and simplifies system architecture [1]. Cloud-based apps are enriched with intrinsic cloud features, including multi-tenancy, scalability, agility, and elasticity [2]. Some research even uses the “cloud-friendly” term to define companies relating to cloud technology or saying the sector has become

“cloudy” [3]. On the other hand, these models place greater demands on IT-business alignment and the endogenous agility and flexibility of change management processes. The latter can be especially crucial and challenging in countries with a tradition-focused culture and low rate of business adaptation to changing environments, such as Japan. In response, Cloud-services providers, meeting with strong resistance, had to adapt their businesses in these countries. They initiated robust business development initiatives to establish clarity around Cloud technology, and pushed digital transformation projects for traditional customers, who prefer on-Premises concepts and complete control of IT infrastructure management processes. The great advantage of Cloud technologies is that they promote the opportunity to delegate maintenance processes outside of the customer organisation. But they require giving third-party companies access secure customer data, as well as to some extent dictating how a company’s IT environment and business processes must be organised.

This research aims to define a systematic approach for describing business challenge resolution by using available scientific knowledge in the area of cloud-based enterprise systems, and determining its applicability by practical realization in the business environment. It tests the endogenous agility of SaaS provider companies and their expanded exogenous opportunities in the form of modified business connections with customers. This research takes a people-process-technology approach to determining how to break down market resistance in the Cloud-adaptation area. The Design Thinking approach was selected to build a system analysis of the creation of a Cloud Mindset in the Japanese market.

2 Related Works

Following areas of science articles were analysed: Cloud technology adaptation challenges and solutions, Design Thinking appliance for software engineering and business processes building, Enterprise systems evolution with Japan’s cultural specifics.

Key concepts, architectural principles, state-of-the-art implementation, and research challenges of Cloud computing, such as Automated service provisioning and Software frameworks, are highlighted in [4] and are still relevant now. Service-oriented architecture and microservices and challenges resulting from multi-tiered, distributed, and heterogeneous cloud architectures cause uncertainty that has not been sufficiently addressed [5]. The area of new actual research challenges also relates to the self-adaptation process of Cloud applications from control engineers’ perspective. These research challenges are due to the nature of software applications [6]. A different area of challenges is architecture-related challenges for cloud-based software systems driven by IT systems’ complexity growth. Unique challenges exist in this area as the systems to be designed range from pervasive embedded systems and enterprise applications to smart devices with the Internet of Things [7]. Researchers provided a classification of the state-of-the-art of cloud solutions to sort different challenges. It’s argued there is the need for model-driven engineering techniques and methods facilitating the specification of provisioning, deployment, monitoring, and adaptation concerns of multi-cloud systems at design-time and their enactment at run-time [8].

Several practical solutions were developed for particular industries and countries. New challenges were raised and resolved by the unique requirements of the e-Healthcare

industry for using cloud services by e-Healthcare providers. These challenges are regulatory, security, access adaptation, inter-cloud connectivity, resource distribution [9]. From a regional perspective, local challenges and acceptance of cloud-based services, where the organisational context is based on local governments in Australia, are highlighted in [10].

Analysis of studies of the existing literature on design thinking for innovation and accounts of using design thinking for innovation in practice was done in the perspective of organisational culture [11]. It is argued that the power of design thinking is in the tension between seemingly opposite ways of thinking, such as analytic thinking versus intuitive thinking and linear thinking versus thinking in iterative processes. For design thinking to flourish, it needs to be embedded in an organisational culture capable of maintaining a dynamic balance on a number of fundamental tensions in innovation processes.

Especially, Design Thinking is in wider use within software companies in the context of multinational organisations. Research in Design Thinking suggests that being exposed to Design Thinking changes the mindset of employees [12]. Evaluation of how the Design Thinking approach is integrated with Agile Software Development methodologies was done in the past. The results show that most of the integrated models are applied throughout the software life cycle [13]. The integrated models resulted in a better approximation of end-users and the development team, improving the software's quality and usability. Design Thinking is used to gather customer requirements during product development. Industry-specific case study research describes the need to facilitate an in-depth understanding of healthcare stakeholders' realities in the context of their day-to-day experiences, identifying the need to introduce a pre-software requirements phase [14]. Thus, Design Thinking techniques were used to inform healthcare innovation.

Besides corporate use, Design Thinking is used as a methodological approach for the instruction of Software Engineering at the undergraduate level [15]. It aims to create innovative software products from scratch and go beyond the typical "analysis – design – implementation – testing" process to reinterpret it with the "empathize – define – ideate – prototype – testing" proposed by Design Thinking. A case study on how universities plan to implement Design thinking strategies to support graduate students' project-based education is presented in [16]. Design thinking helps not only in software engineering but also in organisation adaptation – moving from a product-centric focus into an organisational focus. A case study from the aged care field on developing environmental sustainability strategies using design thinking is presented in [17]. Changing existing methods are quite typically made for particular Design Thinking appliance use-cases. Another industry example of Design Thinking use for sustainable smart energy system design requires extended and modified methods to suit the content of the study [18]. For Cloud topics, there is a small number of articles. One study proposed a method of evaluating cloud platform service usability by implementing design thinking for integration analysis [19]. These results show the combination of using grounded theory for persona creation and the subsequent tasks for evaluation was effective in capturing the perspectives of tenants seeking information on the cloud platform service.

Questionnaire-based research was done into Japanese companies' awareness of Cloud Computing, main concerns, and challenges, and into what Cloud computing lacks to become primarily accepted and adopted [20]. It is pointed out that more cloud computing services are yet to be created and improved to appear attractive and increase the adoption rate among the Japanese market. In that respect, security issues are the main

obstacles to overcome, not only for fortifying the underlying IT infrastructure in the provider's possession but also in terms of how to deal with disruptions in the continuity of the services and how to guarantee service availability. 13.2% of the respondents are still unaware of the term Cloud Computing. It is worth mentioning that none of them think of it as a trend that will disappear soon.

Existing studies widely cover Design Thinking's appliances for software engineering, but not for cloud-based enterprise systems. Cloud adaptation challenges' correlation with selected countries' cultural specifics were discussed in several articles, but no defined solution was found. This knowledge gap highlights the scientific value of the current research.

3 Design Thinking Workshop Preparation and Conducting

3.1 Workshop Preparation

The workshop preparation included goal definition, preliminary research, workshop plan preparation, and Design Thinking methodic adaptation according to the defined objectives.

Two main objectives were defined – science research and practical workshop goals that are correlating. First is a Design Thinking methodology knowledge area enhancement, and second is commercial benefits gain for the cloud provider in the highly competitive market. The workshop goal was to define the strategic and change management initiatives, including action plan definition for the market development by generating Cloud Mindset. Purely Cloud-driven market growth is calculated as a Compound Annual Growth Rate (CAGR) for the selected procurement and business network market. For instance, according to Gartner, with a CAGR of 15%, Cloud is the main driver for growth. By 2024, cloud subscription revenues will likely account for 99% of the APJ market. As known, Japan does not have the reputation of a fast-changing environment [20]. For Japan's market, this proportion is relatively lower, driven by a lack of local trust in modern emerging technologies and firm intention to have complete control of the end-to-end business processes that contradicts approaches based on IaaS, PaaS, and SaaS models.

In Japan, there is a proverb called “sanpo-yoshi”. “Sanpo” indicates three parties, and ‘yoshi’ represents something good in Japanese. The proverb means “good for everyone” [21]. Since these three parties have conflicting areas of interest, it is necessary to admit that while the three parties seek their benefits, they also need to make concessions to achieve the collectively beneficial state. Japan's semiosphere was used to consider national specifics, such as respect, safety, and stability perspectives (see Fig. 1). These national qualities are crucial for the initiative's creation for cloud-based systems acceptance and adaptation for the market. Design Thinking as an approach to getting that agreement between “sanpo” is well suited for this culture because it's also traditionally based on different opinions, group discussion, and communication [22].

Hasso-Plattner Institute (HPI) defined six phases of design thinking taken as a basis for the workshop planning: Understand, Observe, Point of View, Ideate, Prototype, Test (see Fig. 2) [23]. Phase selection is similar to the intuitive workflow process of a designer. All the phases are qualitatively essential and can't be skipped, according to the methodology.

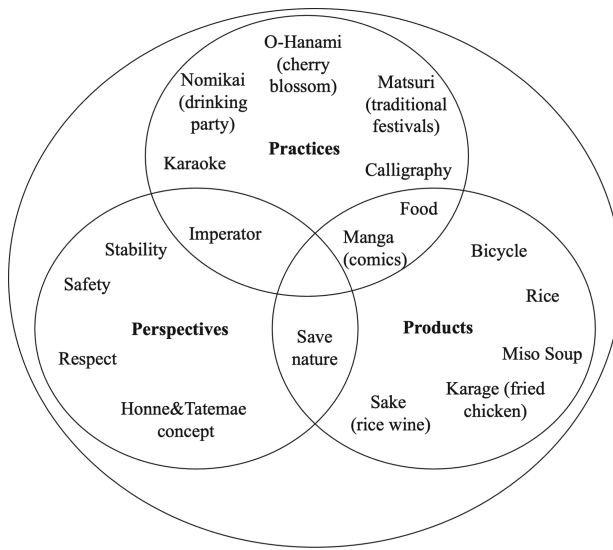


Fig. 1. Japan's semiosphere

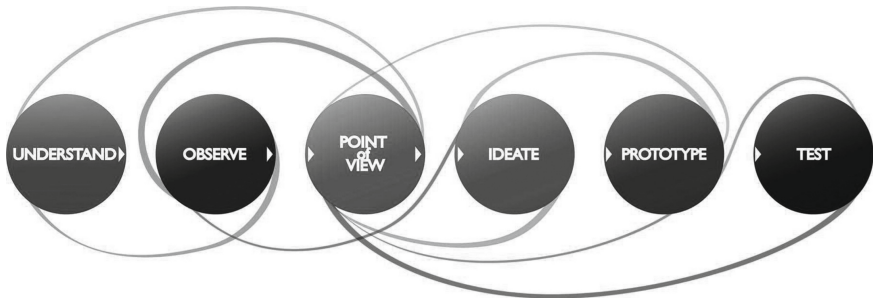


Fig. 2. The design thinking process model at HPI

The Understand phase was done beforehand and relies on integral marketing research and previous customer experience with SaaS business solutions. It was identified that more than half of negative customer escalations were caused by a misunderstanding of cloud-based enterprise systems specifics, such as limited options to change the by-design functionality, listed ways and points of system enchantments via the APIs, scheduled events for the releases to fix the system bugs, and new functionality utilization. Internal SaaS provider corporate data was used for problem area preliminary research, and additional questionnaire was prepared, distributed to the subject-matter experts, collected during the interview sessions, and analysed for the knowledge gaps. Following the methodology, the preparation of a “Personas” technique has a special place. Therefore, the preparation is described in more detail below.

Personas are a representation of the cloud services' end-user; thus, a detailed questionnaire was prepared. The questionnaire covered the following aspects: name and age, position and area of responsibility, background (hobby, family, personality), quote (something he or she says often), stakeholders (who does he or she work closely with, who are his/her "army," which resists against him/her), known business priorities (short and long term goals, how his/her company exceeds over competitors), current initiatives (central theme, what drives him/her, what does he or she care, what goes him/her to lead change), success measurement (known KPIs), and others motivators. The questionnaire was built in a format of the persona's description template. It was used during the interviews with experts in cloud provider companies who were interacting with the customers a lot and can represent customers' voices. After the consultations, three customer personas were prepared and printed for the workshop. It provides a necessary input for the "Meet your customer" exercise at the observation phase conducted during the workshop. This exercise was based on the "Empathy Map" technique.

The workshop plan also includes the following Design thinking methods and techniques related to the point of view definition phase:

- "Magazine cover creation" exercise. This exercise was based on the "Context Map" technique that was transformed. Considering that person for the map is being created beforehand, the outcomes should be used on the next steps and focus on the prospects. It covers following dimensions: customers, competitors, technology, company, situation, economic or social trends, industry. The outcome for this exercise is a visual document that enables you to start a conversation about core stakeholders. Discussing the points of disagreement lead to new thoughts and understanding of the company and will set a singular base for further design thinking activities.
- "Current/Future/Barriers" technique [24] for current customer experience and value definition and "the ideal future" barriers definition. In the current stage, participants state their assumptions (may include perceptions, requirements, or constraints) about a situation or the problem. Then they try to reverse the premises to see if new opportunities are revealed. It creates a clearer picture of the vision, outcomes, or problem (it's crucial that it's a shared view of the problems). In the original technique, four vertical flip chart paper pieces, taped in a row, are used: Current, Barriers, How Might We and Future. We decided to reduce it to three by moving the "How Might We" part to the following stages for a deeper discussion. Input data for the "Future" section was taken from the previous "Magazine cover creation" exercise.

After the break in the schedule, the Ideate phase starts. This phase includes two main exercises:

- The first exercise is based on a combination of two techniques: "Dreamer/Realist/Critic" and "Affinity Mapping". The purpose is to go through a complete idea generation-exploration-evaluation cycle. To have at the end an expansive idea, practical ideas, and evaluated ideas. The core concept is to wish as a dreamer and play the realist to work it into a practical idea, then put on the critic hat to poke holes in the idea. Originally this technique was developed by the Walt Disney Company [25, 26]. As a next stage, the final ideas go through the "Affinity Mapping" technique to

sort and prioritize ideas or data quickly and visually for the next exercise. We asked the group to organise the collection of ideas or data into clusters based on similar characteristics.

- The combined ideas were carried to the extended version of the “Who + Do” technique [27], which is quite similar to the “create a project plan” method. The final exercise with the name “Who-Do-Through-When” was for the clear RACI model defining. We use results of this exercise for the further prototyping phase.

Final results are presented to the whole audience for their awareness and feedback collection. Prototyping and Testing phases were planned for the out of the workshop discussion because most of the ideas prototyping requires deeper dialogue with a broader audience. The reason for this is the nature of ideas – it’s a business operation of a global IT company. Some of them were pretty clear for immediate implementation. Some of them require careful study with extensive data analysis. Some of them relate to the stakeholders out of the participant’s list. We expected these outcomes, and the goal was strategic and change management initiatives, including action plan definition for the market development for the next following-up activities.

3.2 Workshops

The results of practical innovation are three essential components: design thinking process, variable space, and multidisciplinary teams. As the design thinking process was described above, the spaces and the team’s characteristics are listed below.

The workshop’s environment (see Fig. 3) was specially designed and prepared for the brainstorming and Design Thinking workshops-like conduction. It includes a spatial room, whiteboards, flipcharts, a sufficient number of colored markers, stickers, and other stationery. Interior is also designed differently from the classical corporate-style meeting rooms to activate the right mood in participants. Considering that the sessions were conducted during the pandemic time, additional working environment requirements were requested, such as enough space for social distance and regular airing of the room.

The working group was primarily formed from the department’s management representatives, who were empowered to make decisions regarding the company processes change or strongly influenced these changes. Some specialists were also invited to the workshop to get feedback from different corporate hierarchy levels. The following SaaS organisations’ departments participated: sales, sales support experts, functional and technical consulting, post-deployment customer management organisation, value advisory, and product engineering. Three groups were defined with four participants each, excluding one facilitator for each group (one leading facilitator and two supportive) – fifteen participants in total. Two groups were Japanese-speaking, one English-speaking. The whole explanation and instructions were done in English with additional Japanese instructions for the two groups individually. The company’s top management representatives performed a session opening to motivate the participants.

The Observe Point of View definition phase was conducted successfully with high engagement active involvement from all the participants. Persona definition created by one team is presented in Fig. 4 as an output example.



Fig. 3. A special environment for conducting the workshop



Fig. 4. An example of “Persona description” exercise outcomes

The Point of View definition phase was done more actively by warmed up groups and made a clear focus on the target state. The “Magazine cover creation” exercise’s outcomes (see Fig. 5) were painted by hand real and imagined magazines covers with the core stakeholder (CPO, CFO, CIO) on the cover.

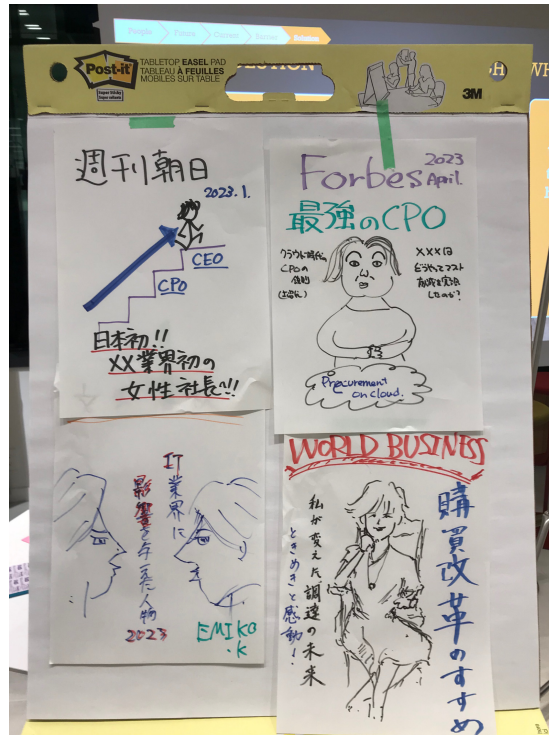


Fig. 5. An example of “Magazine cover creation” exercise outcomes

The ideate phase was the most challenging period for the teams. It triggered the deep cross-team collaboration around internal business processes, market positioning, cooperation with partners, and other themes crucial for the Cloud business. An example of one “Dreamer/Realist/Critic” and “Affinity Mapping” exercise outcomes is shown in Fig. 6.

A strategic and change management initiative, including an action plan definition for the market development for the subsequent following-up activities, as defined on the last stage (see Fig. 7). The team managers’ participation created the unique environment when each team can see the other’s team contributed to the cross-teams initiatives and ready to help and contribute itself.

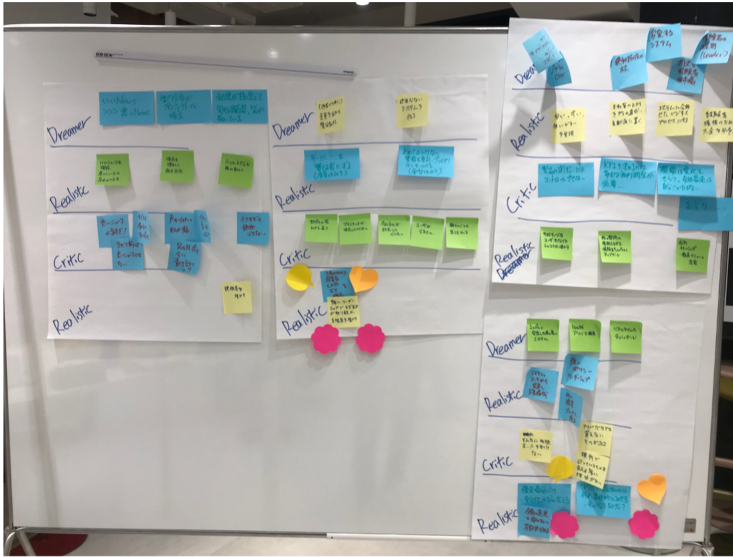


Fig. 6. An example of “Dreamer/Realist/Critic” and “Affinity Mapping” exercise outcomes

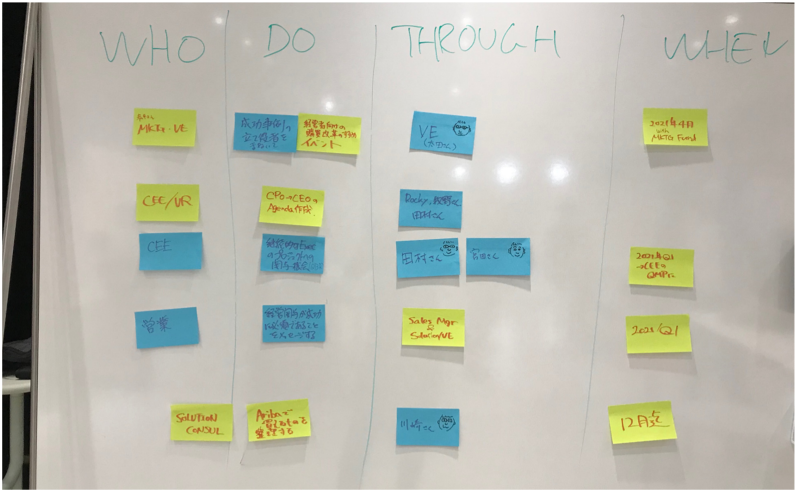


Fig. 7. An example of one “Who-Do-Through-When” exercise outcomes

A final presentation of the results was done in the native languages of each team – Japanese for the two groups and English for the one unit (the facilitator of the English-speaking team provided simultaneous translation). It was important in Japanese culture to use the native language to understand each responsibility and detail of the further collaboration. Top management representatives did the closing words to appreciate the productive engagement and highlight that prototyping, testing, and implementation will be done regularly.

3.3 After Workshop Activities

After workshop activities included two workstreams: results formalization and regular meetings for the idea's realization tracking.

The final results were packed into the PPT file and consisted of final ideas with a timeline and responsible persons and photos from the session, including photos of all exercise outcomes, translated into English.

Regular meetings were scheduled bi-weekly to track the execution statuses and drive the organisations' change management initiatives. Prototyping and testing activities were done selectively for some ideas.

4 Results and Discussions

During the workshop, seventy-six ideas were generated. Nine of them were grouped, prioritized and defined as a strategic initiative for execution.

The leading nine ideas relate to the following two main groups:

1. Endogenous initiatives and processes, primarily strategic initiatives that create new strategies or change existing SaaS provider company processes.
2. Exogenous initiatives and processes that affect interactions with customers.

To deploy ideas demanded by the needs of change management, we analysed existing ongoing strategic initiatives in the company. Internal strategic initiatives are typically hard to initiate from scratch as they require a considerable time investment, budget approval, and other formal procedures, especially in big international companies. Luckily, we were able to initiate a three-year market unit strategy, so all the change management ideas were merged with this project. It allows the delegating of execution while receiving regular status updates on realization progress. For instance, a new type of cloud-consumption-based customer contract requires various teams' involvement. For this idea, the decision was to proceed with prototyping and testing phases according to the Design Thinking methodology.

Other internal initiatives that did not have interaction with existing strategic initiatives were built as new initiatives. Ideas such as recent sales play run and rearrangement of technical architecture positioning also require prototyping and testing phases – something which was achieved, and all ideas relating to which were agreed for production use. Simple ideas, such as increasing internal awareness of particular topics, extension of the participants' list for the Quality Business Review with strategic customers – were implemented without prototyping and testing because their benefits are quite obvious.

Ideas related to interactions with SaaS customers mainly fall under the responsibility of marketing departments. They relate to the organisation of business development customer events, creation of specific digital transformation customer reference stories, and generation of different market-specific media to build market awareness around cloud-driven business transformation projects.

Before the Design Thinking workshop, potential resolution areas for Cloud Mindset generation related only to marketing activities. The workshop facilitated the discovery

of new improvement areas and defined change management opportunities. The Design Thinking approach activated deep cross-team interactions and generated creative solutions. The positive feedback received from the top management team demonstrates the high practical value of the study.

5 Conclusion and Future Work

In Japan, as in other tradition-focused cultures, Cloud-based enterprise systems have met with strong resistance – even as they have grown rapidly in importance in the global IT market. Our case study shows the practical application of Design Thinking methodology in resolving the challenge that SaaS providers face in breaking down culturally-ingrained resistance to the technologies they offer. Our scientific research looked at possible improvements to Design Thinking methodology, with classical techniques adjusted systematically to be applied to the field of Cloud study by SaaS providers. One structural element added to the standard methodology is a consideration of the cultural semiosphere as a way to refine classical Design Thinking techniques. Design Thinking methodology allowed us to define a foundation stone upon which Cloud operators in the Japanese market may build a Cloud Mindset. The ability to first identify which initiatives to pursue and then deploy them demonstrates SaaS providers' endogenous agility, while exogenous agility is demonstrated by increased possibilities for connections with customers.

Six phases of the Design Thinking approach, from understanding the problem to testing prototype solutions, were described and covered in explanations of required changes in the standard technique applied in the IT industry. Design Thinking workshops enabled us to define clear next steps to processes, which then led to the realization of ideas capable of achieving commercial success. Three essential components of the innovation's practical results – Design Thinking process, variable space, and a multi-disciplinary team – were combined to achieve the study's aims. The Design Thinking approach showed promising results when several teams' results pointed toward one solution appropriate to a particular organisation. The methods developed can now be used by other SaaS providers in countries with similar semiospheric elements – especially those with tradition-focused cultures and low cloud-based enterprise system adoption in the market.

Our next work will look at applying the results gained from our market research in Japan to other markets. We expect new Design Thinking modifications and different workshop outcomes to be influenced by cultural aspects of the acceptance of Cloud-based enterprise systems.

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