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IT INVESTMENT CHALLENGES IN REALIZING DX FOR JAPANESE COMPANIES

Abstract:

In recent years, Digital Transformation has become a new mission among companies. As one of the ways to achieve this transformation, an increasing number of companies in Japan have been working on Enterprise Agile. However, there is little literature on the application of Enterprise Agile in Japanese companies, and the interpretation of Enterprise Agile is not uniform. In this study, we conducted an interview survey of practitioners representing three Japanese companies engaged in Enterprise Agile development, and clarified investment decision criteria and decision-making processes in system development based on an analysis using a simplified version of GTA(Grounded Theory Approach). As a result, it was found that investment decision criteria and decision-making processes in companies practicing enterprise agile development differ depending on the business style of the company, and that conditions such as business plans, budget handling, development objectives and related organizational structures, and development scale are related thereto. Furthermore, based on the concept of investment decisions as a viewpoint, which is the result of this study, we created a table that enables us to confirm the position of companies working on enterprise agile. By utilizing this table, companies can objectively grasp the status of their efforts, and furthermore, by considering future measures, they can use it to realize continuous Enterprise Agile.

Keywords:

Digital Transformation, Enterprise Agil, IT Investment, Apprival, Development Process

1 Introduction

In 2018, the Japanese government recommended digital transformation (henceforth DX). It published a DX guide for enterprises called the DX Report: Overcoming the IT Systems "2025 Cliff" and Full-scale Deployment of DX (METI, 2018). The report states that to advance DX, it is essential to make maximum use of data, apply new digital technologies, adapt existing systems, and advocate the need to utilize agile application development.

According to the "State of Agile Report," which published a survey of Agilists in Europe, the United States, and other parts of the world every year, the adoption rate of agile application development in FY2022 was 80% (digital.ai, 2022). In the 2023 report, 60% of the respondents gave the framework they rely on a spec

ific name when proceeding with large-scale software development in an agile manner, and 26% of them answered "Scaled Agile Framework" (hereafter referred to as SAFe), indicating that large-scale agile development is being promoted. The results indicate that large-scale agile development was promoted. (digital.ai, 2023).

As for the current situation in Japan, the adoption rate of agile development was 22.9% (N=542) according to a survey conducted by the Information-Technology Promotion Agency, Japan (IPA, 2023). Regarding the impact of DX on the adoption rate, in a survey (N=715) conducted prior to the release of the DX Report (METI, 2018), Gartner (2019) reported an agile-type development adoption rate of 15%, excluding plans to scale back. From the results, it can be inferred that the adoption rate of agile-type development increased owing to the acceleration of DX initiatives. According to a survey (N=1025) conducted in 2022 by the Japan Information System Users Association (hereafter referred to as JUAS), 62.8% of the companies that had "already adopted" agile development responded that they were "specifically working on DX and seeing results" or "specifically working on DX but results are yet to come." The percentage of companies that answered either "are specifically working on DX and achieving results" or "are specifically working on DX but results are yet to be achieved" was 62.8% (JUAS, 2023). (JUAS, 2023). From this result, we can see that most companies attempting to engage in DX have introduced agile development.

These data indicate that although Japanese companies have been introducing agile development as part of their DX efforts, the adoption rate is low (22.9%), indicating that Japanese companies are taking the initiative to promote agile development in an environment where legacy systems remain.

Based on these issues, this study examines how companies that promote large-scale agile development to realize DX select projects and make investment decisions for development. This study aimed to clarify the characteristics and issues in the process of investment decisions and approval by companies that promote agile development as a method of DX realization.

2 Previous Research

This section provides examples of studies related to qualitative research on large-scale agile development.

Investment decisions in Enterprise Agile in Japanese companies have not been confirmed in reported cases. Daneva (2013) investigated agile practices for prioritizing requirements in the development cycle of three projects promoted by distributed outsourcing in a CMMI level 5 company. The results of this study are clearly different because they relate to investment decisions and decision making.

Paasivaara et al. (2017) discussed a case study of distributed development by applying SAFe to the software development company Comptel. Data were analyzed using GTA. The concept was generated from data obtained in the interviews, and GTA was applied to the transition process from the user story to the delivery story in the projects. The resulting diagram is shown as "The user story - delivery story translation process."

Turetken et al. (2017) proposed a maturity model as a structured step-by-step approach for SAFe applications.

These are examples of SAFe implementation and its results or evaluation; there has been no discussion on investment or budgeting. In this study, I interviewed the proponents of three companies working on Enterprise Agile, and clarify the characteristics and issues of management awareness, organizational transformation, and investment decisions toward Agile-type development.

3 Survey Method

To achieve the objective of this study, specific information on individual cases was necessary to clarify how companies approach agile development. Therefore, I decided to adopt a qualitative approach in this study by interviewing each participant individually, carefully listening to information based on their experiences and perceptions during the dialogue, and analyzing the information through interpretation to generate detailed concepts.

3.1 Interview Survey

3.1.1 Selection of Survey Participants and Survey Implementation

The survey participants were selected from among those who had interacted with the author for at least one year through business, education, and other public activities for reliable information. Three participants were selected from among those who interacted at least once during the activities. The purpose of the interview was explained to the participants in advance by e-mail, and their consent or refusal was obtained. Those who agreed to be interviewed were selected as survey participants, and semi-structured interviews were conducted either online or in person. The survey participants are listed in Table 1.

Table 1: Interviewees

Number	Type of Business	Organization	post	Position on Promotion Team	Recruitment Framework
1	Finance Banking	IT Department	Department Manager	Organization Manager / Product Owner	-
2	Finance Insurance	IT Subsidiaries	officer	Organization Manager / Product Owner	SAFe
3	IT Services	Corporate Planning	officer	Head of Organization / Product Manager	SAFe

3.1.2 Content of interviews

In the interview survey, I first confirmed the basic items related to the case, such as the industry and business type and the role and position of the survey targets. Then, I proceeded to the questions. The questions were as follows.

(1) What processes are used to approve development projects? and (2) At the time, do you define the expected results after implementation and obtain approval from the concerned parties? (3) Who participates in the review of progress and requirements during development and how? (4) Do you perform a partial release during development? If so, how is this verified? and (5) Do you have a system linked to your operations? (6) Will the post-implementation results be reviewed? (7) Do you continuously monitor your business values after implementation? In this section, we proceeded with the conversation while confirming the actual status of the project or product in Enterprise Agile.

In the semi-structured interviews, we discussed budgeting, organization, evaluation mechanism, and the main proponents of the case study.

3.1.3 Ethical Considerations

The purpose of the study was explained at the beginning of the interview, and the participants' consent was obtained before recording. In addition, the confidentiality of the recordings, such as not using the information for any purpose other than research, and the method of storing the data were also presented in writing and agreed upon.

4 Method of Analysis

GTA is a theory and method of qualitative research discussed by Glaser and Strauss (1987). In this study, a simplified version of the GTA was considered appropriate because the purpose was to confirm the experiences and perceptions of the participants and to construct a conceptual model rather than to theorize the transformative process of people working with each other (Willig, 2002). To situate the categories of relevant personal experiences, we performed interceptions using relevant paragraphs or rows (Charmaz, 2014). An M-GTA(Modified Grounded Theory Approach) worksheet was used as the analysis tool (Kinoshita, 2006). Next, categories consisting of relationships between multiple concepts were generated by examining the relationships between each concept with other concepts. Next, a list of categories was generated from multiple groups. Finally, concepts related to IT investment and budgeting were extracted from the analysis results and a process diagram was created.

4.1 Background of Data Analysis

First, concepts were extracted from the survey participant (first person in Table 1), who is a practitioner in the IT department of a financial company. Subsequently, I transcribed the content of the interview from digital records with the second research subject (the second person in Table 1), who is an officer of the IT subsidiary of the same financial company and is responsible for the development of the company's headquarters. I compared the similarities and differences between the two cases and described them on an analysis sheet. The last participant from the IT company was interviewed; the interview content from the case study of their company's development was created on an analysis sheet, and concepts were extracted, deleted, and integrated. To avoid arbitrary interpretations, comparisons were made between similar and opposite cases.

From the interviews, it was confirmed that there were two types of projects: "projects with a fixed term," in which IT investment is made as part of the annual budget, and "products without a fixed term," which are developed by repeatedly applying for the budget even during the development process. This difference was clarified by generating concepts and categories based on the presence or absence of fixed terms.

4.2 Characteristics of the Participant Cases

First, the major financial company in research Participant 1 is strengthening the promotion of agile development as an initiative for digital transformation (hereafter referred to as DX). However, the scale of the agile development was small. In terms of internal training materials, agile development is indispensable in today's world, with increasing uncertainty and demanding requirement chains (interactions). Although approval was required at the time of project implementation regardless of the development model, agile development was added as an option to the internal development standard to promote a shift to agile development.

The example of Survey Participant 2 is a case of large-scale agile development at a major financial company that develops new products and services for agents. As a DX initiative, the company organized an independent department for the agile development of its strategic products and services since 2020. Currently, the company has 50 internal members and 110–120 partners, and is conducting large-scale agile development using SAFe.

Finally, Survey Participant 3 is a system integrator that undertakes SAFe consulting and system development and develops its own products by applying SAFe. In addition, they are trying to promote agile management within their organization.

5 Analysis Results

5.1 Generation of Concepts

This section outlines the analysis worksheet created by extracting concepts based on the verbatim transcripts of the transcribed interviews with survey participants.

5.1.1 Application and Approval for Project Implementation

All applications for in-house development projects in the organization of Participant 1 and their decisions were made based on requests for approval, regardless of the development model. The level of approval is determined according to the amount of money written in the request for approval, and agile development is no exception. The business unit is responsible for profits, and the Key Performance Indicator (KPI) is used as an indicator based on the return on investment (ROI). Even for items that cannot be measured in monetary terms, the approval form indicates the need for such items. The amount of investment in agile development is capped; the budget is secured in the form of repeated fixed-term projects of six months, one year, or less; investment decisions are made within the annual budget. The management committee conducts a profit evaluation throughout the first five years of development.

5.1.2 IT Investment and Budget for Product Development

In the case of Participant 2, a digital budget agreed upon by the management and business department is secured annually, including a budget for projects that start from idea development (strategic development). The first prototype is approved initially. If the results of the hypothesis testing are favorable, a budget is applied for the continuation of the project, and the budget is added for another quarter, where priorities are reviewed, and the project continued. This process is repeated, and if the results of the hypothesis testing are unsatisfactory, the process ends.

In the case of Participant 3, the investment targets for internal development are determined based on the annual investment strategy, and the investment and progress are evaluated every quarter as a product development project. Consequently, projects to be continued across fiscal years are determined and evaluated every quarter in the same manner.

5.2 Generating Concepts, Categories, and Category Groups

In the process of analyzing verbatim interview transcripts, the concepts generated were categorized into two groups: project cases with fixed terms and product cases without fixed terms. Table 2 shows the "List of Concepts, Categories, and Category Groups" related to investment decisions. The classification of projects and products is marked in the "Commonality of Concepts."

Table 2: Category group/ Category/ Concept List

category group	category	concept	Definition.	Commonality of concepts
Management involvement and support	Management understanding	Promote agile development	Management's public commitment to promoting agile development as a strategy	■
	Evaluation of plans and performance / Investment and evaluation	Approval of project implementation	Management's commitment to the structure and budget for development	◆
		Product development decisions and budgets	Approve and secure initial and additional budgets for MVP development	■
Business unit-led planning	Project/Product Planning	Building Development Ideas	Building ideas from the business unit on what to develop.	■
		Application for additional budget	Apply for the next additional development budget once the minimum viable unit (MVP) that can provide value to the customer has been verified.	■
		Application and approval for project implementation	To prepare a request for approval and seek management approval to implement a planned project.	◆
Promote development of business and IT collaboration	Development Planning and Environment Creation	Create and share inception decks	Describe the objectives and key reasons (OKRs) in the inception deck and kickoff materials and share them with stakeholders.	◇
		Prototyping and validation of MVP	Prototype the product image, demonstrate the product concept, and validate it with stakeholders.	◇

■…Product ◆･･･Project ◇...Product / Project Both

5.3 Investment Decision and Decision-Making Process

After organizing the concepts, categories, and category groups, I clarified the concepts and related processes related to the analysis theme, "IT investment and budgeting."

5.3.1 Product Development Process

A process diagram (Figure 1) shows the relationships between the concepts extracted from the product development cases of Survey Participants 2 and 3.

Management's understanding of enterprise agile is a commonly recognized concept, regardless of whether it was a fixed term. In addition, management's (1) "promotion of Enterprise Agile" is indispensable for products that adopt the framework. Management publicly announces the promotion of Enterprise Agile as a strategy, and invites business units to "construct development ideas" based on customer needs. (2) The management team asks the business units to "build development ideas" based on customer needs. (3) The management team "approves and secures the budget for product development" for the budget related to the initial Minimum

Viable Product (MVP) development of the development target projects selected from the ideas of the business units.

After approval, the business and IT departments collaborate to start the development, and (4) "Create and share an inception deck" as a kick-off document. Development repeats the process of (5) "Prototyping and verification" to complete the MVP. The verified MVP is then released.

When an MVP is verified, an (6) "additional budget request" is made to management to develop the next MVP. Unlike in the case of a project, the management will (7) "approve the product development and secure the budget" for the continued development applied by the business unit after the MVP is verified.

Agile development is a commonly recognized concept, regardless of whether the product is a fixed term.

5.3.2 Project Development Process

In the project case (Figure 2) the decision is made based on (1) "Application for project implementation and approval" by the business unit. Here, the return on investment for agile-type development is evaluated after the approval process, and the management decides based on (2) "Approval of project implementation." Then, collaborative development between business and IT begins, and as kick-off materials, (3) "Inception Deck Creation and Sharing" is conducted, and (4) "Measures and Verification" is used to promote development. Here, the decision is made before the start of development, and no additional applications are made after development.

Figure 1: Product based Development and Investment Process

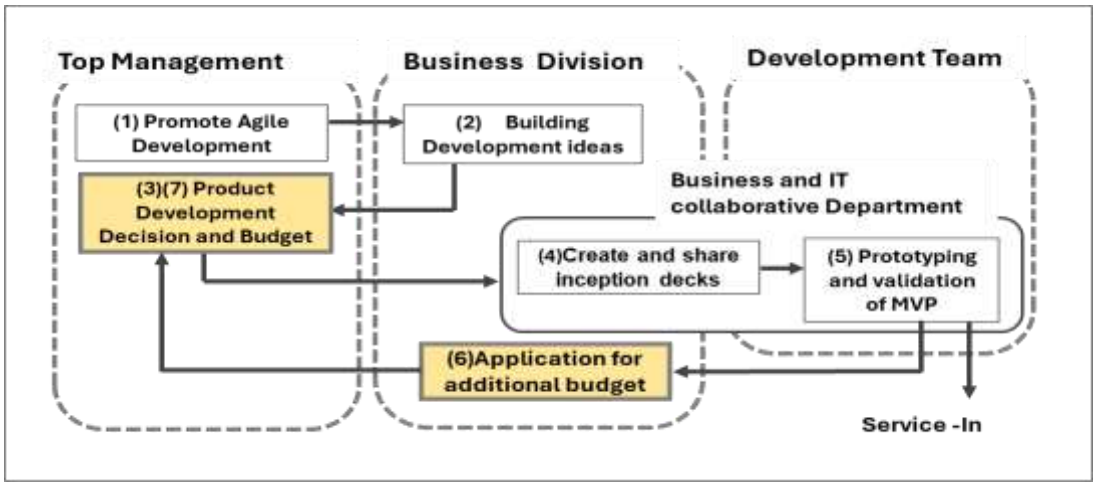
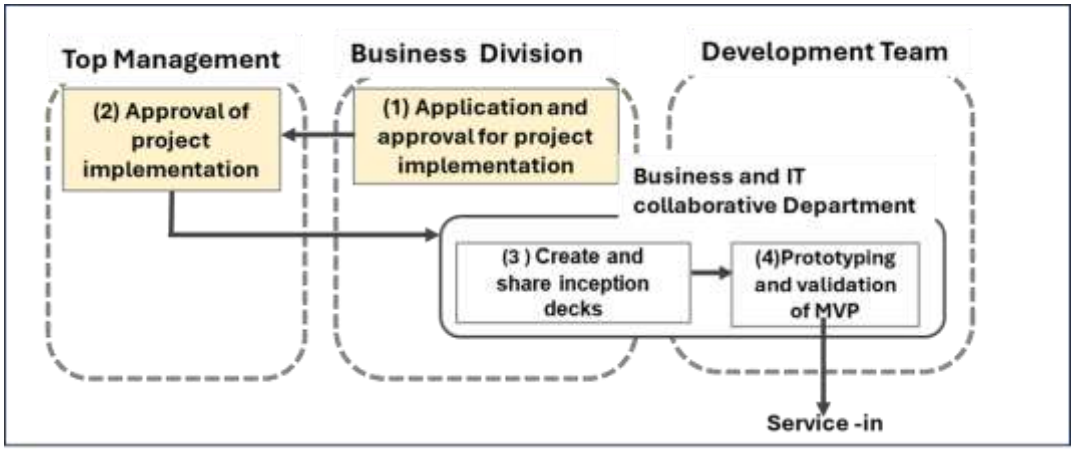


Figure 2: Project based Development and Investment Process



5.4 Characteristics of IT Investment

This section summarizes the characteristics of the Enterprise Agile approach in each case study related to investment decisions and summarizes them in Table 3. The purpose is to enable companies that engage in Enterprise Agile to understand their status objectively and implement future measures.

First, each company was categorized into three cases to see what characteristics are relevant in the process of investment decision-making, from the traditional approval to the "lean budgeting" process of Enterprise Agile. The process shown in Figure 1 is classified as Case 2, and the eclectic practices that do not fall into either of these categories are classified as Case 3. In addition, the items whose relationship to investment decisions is unclear but which may have some influence, such as "in-house production," "development scale," and "performance measurement and evaluation," are similarly classified and presented in Table 3. These were concepts or keywords extracted from the interview data.

Three items were selected from concepts related to investment decisions: project/product planning, decision-making, budgeting, and application for additional budgets. These concepts are also shown in the process in Figures 1 and 2. In addition, the development organization system and the measurement and evaluation of results were selected as related concepts. These items were related to investment decisions made during the analysis process.

According to Participant 2, an independent company-wide development organization was established for the purpose of strategic product/service development in the case of promoting a product from idea creation.

Participant 2 stated, "The major difference between doing agile and WF (type development) is the difference between doing it from an idea (or) the business department having the requirements beforehand. As stated in this article, SAFe is applied as Enterprise Agile for product development created from ideas, and investment decisions are made based on prototyping and verification. This is observed in Case 2 for "project/product planning" and "product development decision and budgeting."

By applying Table 3 to each case, it can be confirmed that investment decisions are related to the agility of the organization and appear in the way the organization is structured, planning is handled, and budget is allocated.

Table 3: Characteristics of Enterprise Agile Investment Decisions

case	Development organization structure	Project/product planning	Approval for product development and securing budget	Request for additional budget	Measuring and evaluating results
1	Organize the organization only during the development period (project type)	Confirmed requirements from business divisions	Next fiscal year budget formulation period	No additions, resubmission as new application	Measurement only when development is completed
2	Establish an independent Agile development organization across the company	Strategic product and service ideation	When selecting an idea	Apply each time after prototype verification	ROI for years , during and after development
3	Organize an independent Agile development organization within the division	Requirements from business divisions and departments, including uncertain requirements	Annual and half-year budget formulation period	Apply for next year's renewal with quarterly ROI evaluation	Regularly measure ROI until development is complete

6 Discussion

6.1 Findings from the Analysis

6.1.1 Characteristics of Organizations in which Investment Decisions are Dynamic

In cases where budgets are secured, decisions are made on implementation. Applications for additional budgets are made on a case-by-case basis, a development system that includes management is established, and an investment environment is in place to continue implementing Enterprise Agile, such as by measuring the ROI during development. Consequently, the in-house production rate tends to be high.

6.1.2 Characteristics of organizations with fixed investment decisions.

When the budget is applied for and secured, the implementation decision is made within the annual and semi-annual budgets, and no additional budget is applied for. The ROI is measured after development, as in WF-type development; however, the organizational structure to continue Enterprise Agile and the environment to handle additional investments are not in place. Enterprise Agile is highly dependent on management's awareness of the need for immediacy, which may affect investment decisions, organizational structures, and in-house production rates.

6.2 Novelty of the Study

Investment decisions in Enterprise Agile in Japanese companies have not been confirmed in reported cases. Daneva (2013) investigated agile practices for prioritizing requirements in the development cycle of three projects promoted by distributed outsourcing in a CMMI level 5 company. The results of this study are clearly different because they relate to investment decisions and decision making.

This study aims to clarify the concepts and approaches of investment decisions and decision-making in Enterprise Agil in Japanese companies. Through a qualitative study, we independently demonstrate the process of investment decisions to realize strategies in the field of information systems. Furthermore, we clarify the process of investment decisions by dividing them according to the existence or nonexistence of a fixed-term nature in the business.

6.3 Usefulness of the Study

In information system development, agile development is used to create new products, services, or projects with many undecided requirements; however, the biggest problem is the difficulty of determining the budget. This problem is expected to increase with the demand for large-scale development.

In this study, we clarified the concept of investment decisions and the process of approaches in Enterprise agile, organized the characteristics of the concept of investment decisions based on the contents of the cases(Table 3), and created a table that enables objective visualization of the situation by applying the actual cases.

Although there are differences in the size of the companies and the investment amount, the table can be used as a reference when considering the organization, internalization, and budget handling of companies. We hope that the results of this study will be useful to companies working on Enterprise Agile in their own business styles.

7 Conclusion

This study aims to clarify the concept and approach of investment decisions and decision-making for the development of Enterprise Agile in Japanese companies. In Japan, more than 50% of large companies with sales of more than ¥1 trillion have introduced agile development, and agile human resources are finally taking root in IT companies. However, few companies practice Enterprise Agile. Therefore, in this study, three practitioners involved in Enterprise Agile in companies were interviewed, and a qualitative survey was conducted using the GTA tool on the information related to the analysis theme "investment decisions and decision-making" from the interviews.

The timing of investment decisions and decision-making processes in Enterprise Agile were clarified, and it was confirmed that the agility (readiness) of companies that practice it is related to the way they handle planning and budgets.

We hope that this research will be useful to companies and organizations that are working on or planning to work on Enterprise Agile and that we can support the implementation of Enterprise Agile in many companies. Furthermore, we would like to improve this research to make it more useful by collecting information from many companies practicing Enterprise Agile in the future.

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