香川大学
KAGAWA UNIVERSITY

Proposal of In-house Development Model for Business System at Kagawa University

Satoru Yamada
Graduate school of Engineering
Kagawa University
Kagawa, Japan

NOTES
In the presentation,
“In-house development model for Business System at Kagawa University” is abbreviated as “Kagawa University In-house development model”.

Introduction

User companies have the problem of ”**starting the development of an information system with unclear requirements**”.

Agile development of the information system in user companies using ”Low-code/No-code tools” is attracting attention as a way to promote DX.

The ”**Kagawa University In-house development model**” is based on the iterative model of agile development. Development is done in phases.

The iterative model of agile development in general aims to increase the product quality of the system.

However, the ” Kagawa University In-house development model” defines a “Hypothesis" that enhances the quality of usability.

Design Thinkig and Lean Startup

香川大学 KAGAWA UNIVERSITY

Design Thinking

"Design Thinking" consists of five steps: "EMPATHIZE", "DEFINE", "IDEATE", "PROTOTYPE", and "TEST".

"Design Thinking" is a necessary concept for creating new value.

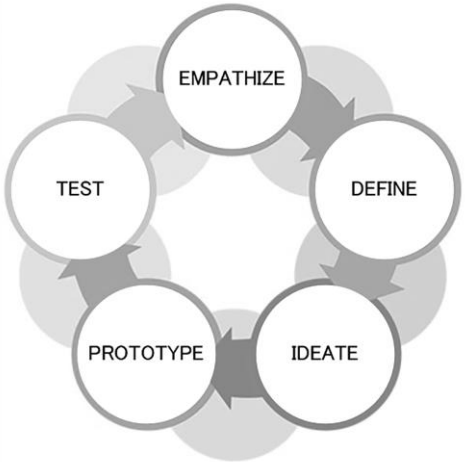


Figure1: Process of Design Thinking.

Lean Startup

It provide users with MVPs based on hypotheses and define value by "Verification" with them through the "Build-Measure-Learn" cycle.

A Minimum Viable Product(MVP) is developed in "Lean Startup".

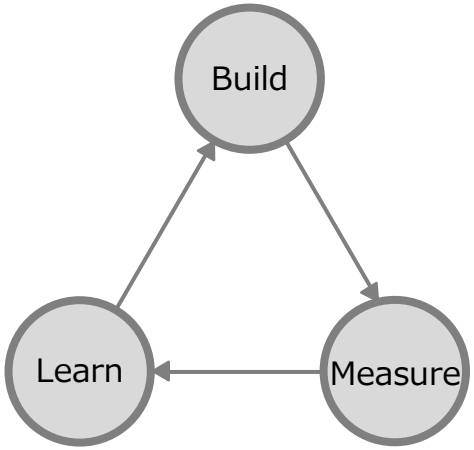


Figure2: Lean Startup

The ”Kagawa University In-house development model” combines "Design Thinking", and "Lean Startup".

User-driven development approach

"End users who have knowledge of the business develop systems and software on their own initiative. It is also important that users take the lead in maintenance“[1].

The user-driven development proposed by Chusho is a three-tier architecture: "Business Level", "Service Level" and "Software Level".

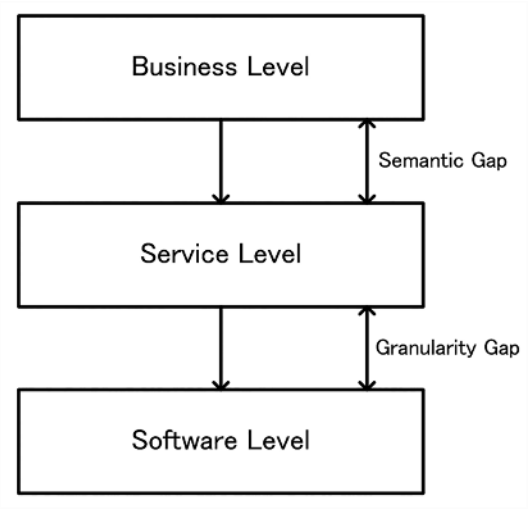


Figure3:
User-driven development approach which Chusho Proposes

At the "Business Level", users with business knowledge create business models.

At the "Service Level", create a domain model based on the "Business Model".

Software is developed at the "Software Level" from the created domain model.

[1] Takeshi Chusho, “Enduser-Initiative Application Development Methods with Business Knowledge”, 2007.

Kagawa University In-house development model

Kagawa University integrated the "Service Level" into the "Software Level" by utilizing "Low-code/No-code tools" based on the tree-tier architecture proposed by Chusho.

In order to emphasize the definition of “Hypothesis” for the realization of “Human-Centered” value and the “Verification” of MVP, we defined a three-step approach (“Business level,” “Software level,” and “Verification level”) with a “**Verification Level**” to “**Verify user value**" the developed system or software.

By iteratively repeating this three-step approach multiple times, users themselves develop the systems and software they need.

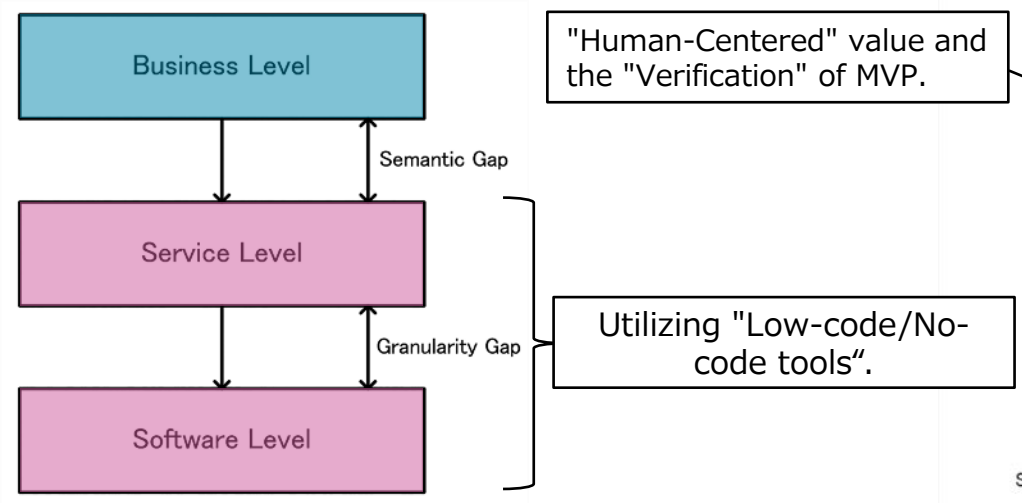


Figure4:
User-driven development approach which Chusho Proposes

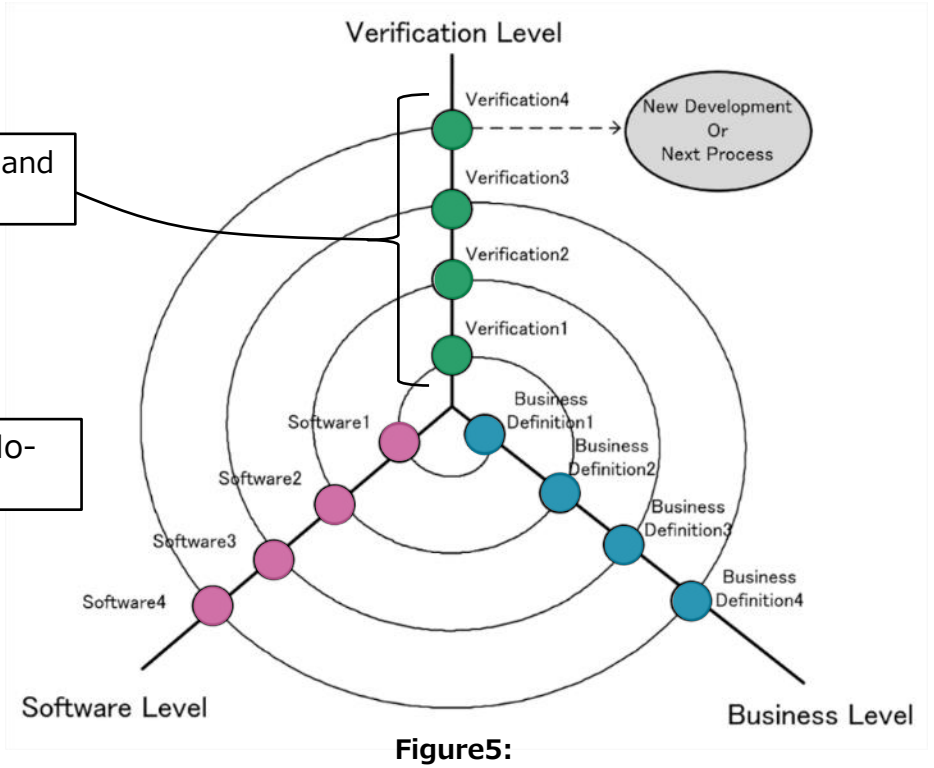
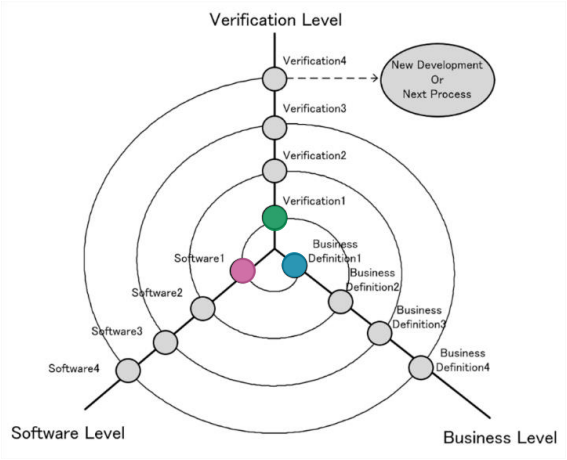


Figure5:
In-house development model for Business System at Kagawa University

System Development using Model

香川大学 KAGAWA UNIVERSITY

Work Record System ver0.1



Report the time of arrival and departure using ChatBot. Data is stored in Microsoft SharePoint.

Figure6: Report work and clock out(ChatBot)

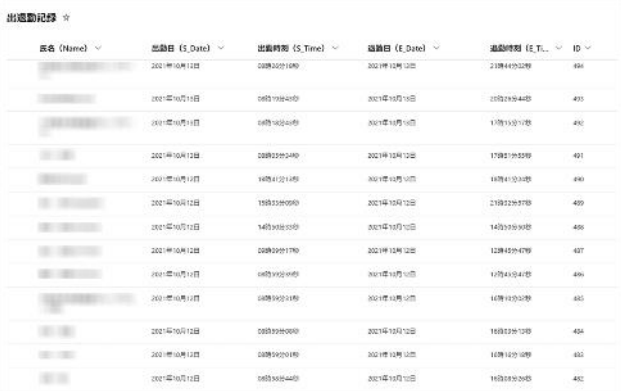
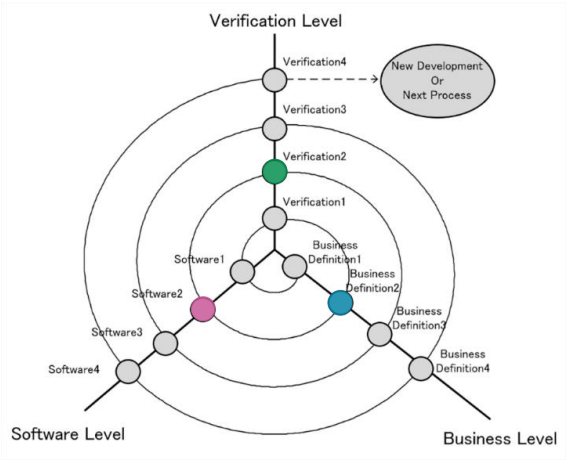


Figure7: "Work Recoed System" data

Work Record System ver0.2



Added to "prevent duplicate registrations function" based on "ver0.1 Verification". Then, the "Overtime(work) request System" was developed.

Figure8: "overtime(work) request System"

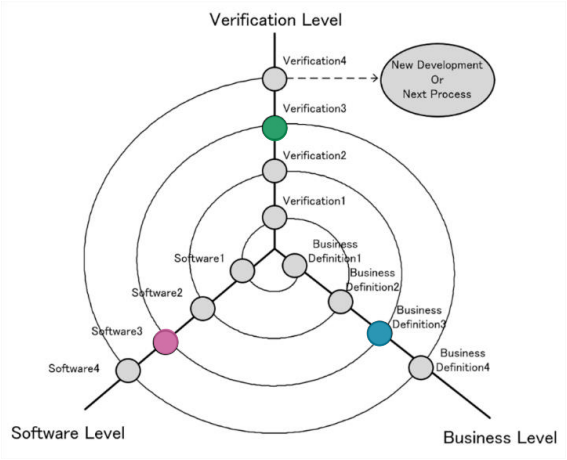
Figure9: Allow/Reject Decision mail.

System Development using Model

香川大学 KAGAWA UNIVERSITY

Work Record System ver0.3

In addition, a “Vacation Request System" was developed.



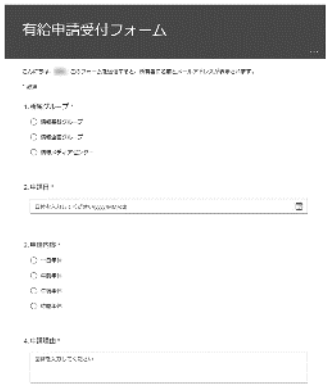


Figure10: “Vacation Request System”

Figure11: “Vacation Request System” data

Work Record System ver1.0

Using “Power Apps” and “Power BI”.

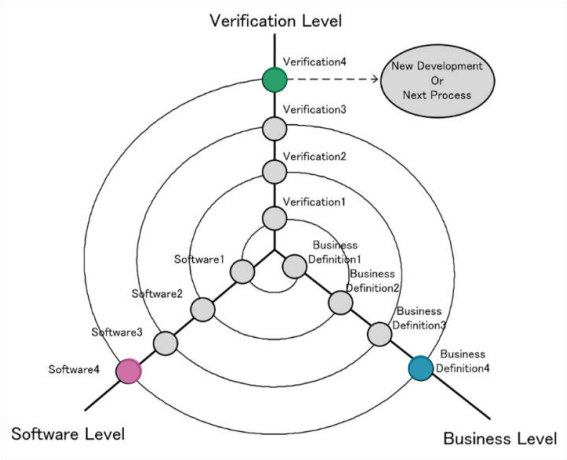


Figure12: “Work Record System” (Powe Apps)

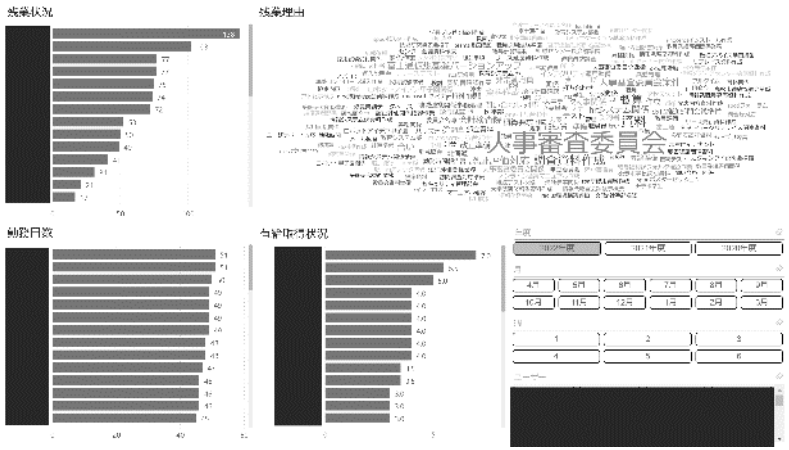


Figure13: Visualization Function(Power BI)

Results

Using the "Kagawa University In-house development model", we interviewed the staff who developed the business system. There are five questions.

Table1: Results of the interview survey

Question	Answer
Q1: Do you feel a "Semantic Gap" from the "Business Level" to the "Software Level"?	• **All four respondents answered "no Semantic Gap".** • "staff members who understand the work develop software at the 'Software Level', so they do not feel a 'Semantic Gap'".
Q2: Do you feel a "Granularity Gap" at the "Software Level"?	• **All four respondents answered "no Granularity Gap".** • The business system is a flow definition using "Microsoft Power Automate" with "Low-code/No-code tools". Therefore, I do not feel any "Granularity Gap".
Q3: An impression of the use of "Kagawa University In-house development model".	• Until now, we could not implement a system without ordering from a vendor, but now we can implement a system with a sense of speed. • We can implement a system that we really think is necessary. • The larger the scale of the system, the more difficult it is for end users to develop.
Q4: An impression of "Design Thinking" and co-creation activities.	• It was easier to share specific issues. • The motivation of the business units made a difference in the results.
Q5: An overall impression.	• the data obtained from the system is useful • I want to improve the system based on the data • reviewing the operations gave me an opportunity to think about whether the operations were necessary.

The interview results indicate that the **"Kagawa University In-house development model", has the potential to solve the "Semantic Gap", and "Granularity Gap".**

Conclusion

In this paper, we define a "Hypothesis" for the realization of "Human-Centered" value. The "**Kagawa University In-house development model**" in which **business systems are developed by "Verification" of the defined "Hypothesis" through co-creation with users, was described**.

The "Kagawa University In-house development model" combines "**Design Thinking**" and "**Lean Startup**“ and define MVP by three steps: "Business Level", "Software Level", and "Verification Level".

The **"Kagawa University In-house development model" has the potential to solve the problem of "starting development with unclear requirements"** for user companies working to promote DX.