

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

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NOTES

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

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 Thinking

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

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

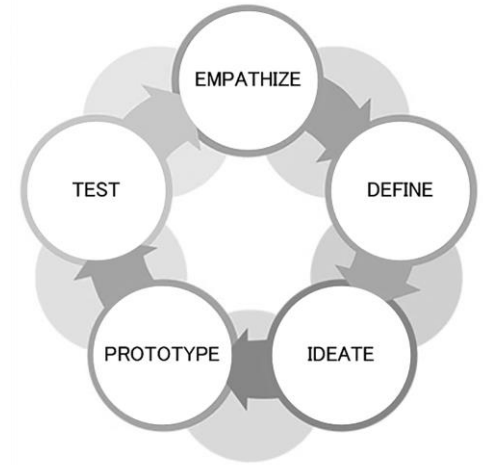


Figure1: Process of Design Thinking.

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".

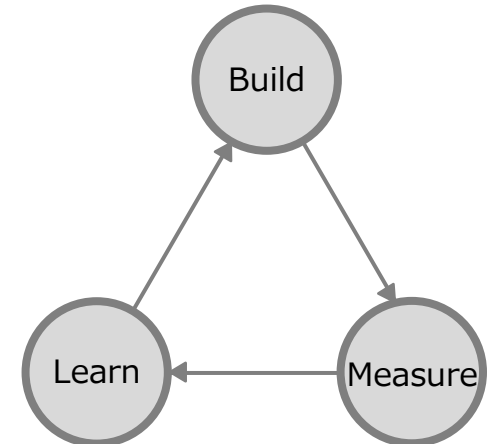


Figure2: Lean Startup

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

"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".

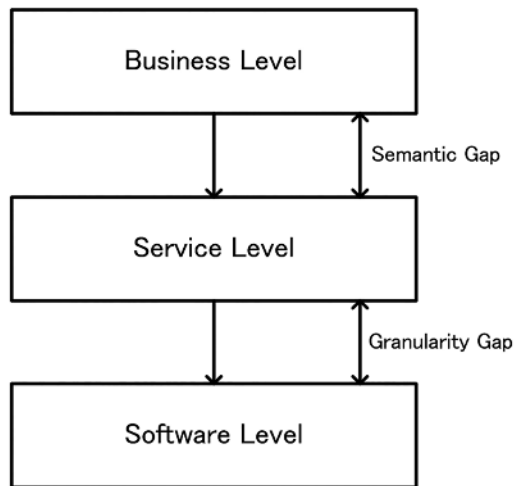


Figure3:
User-driven development approach
which Chusho Proposes

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

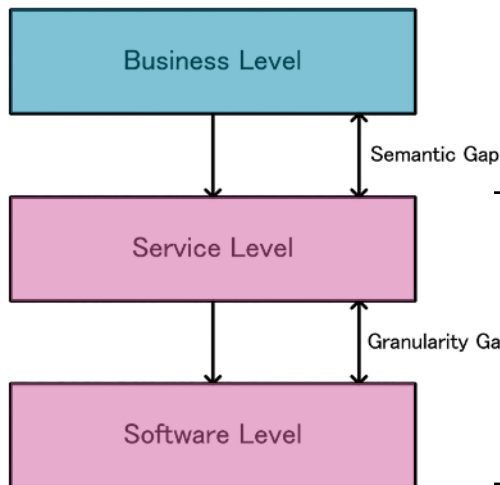
At the "Service Level", create a domain model based on the "Business Model".

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

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.



"Human-Centered" value and the "Verification" of MVP.

Utilizing "Low-code/No-code tools".

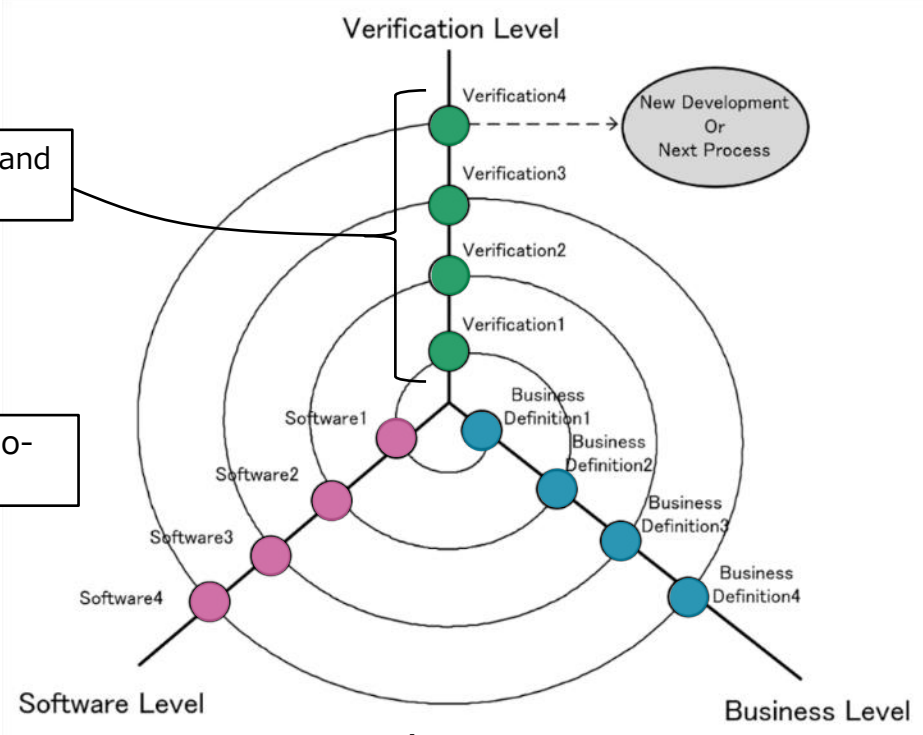
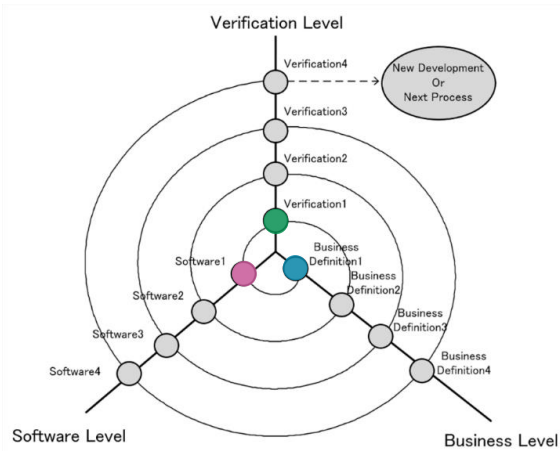


Figure4:
User-driven development approach
which Chusho Proposes

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

Work Record System ver0.1



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



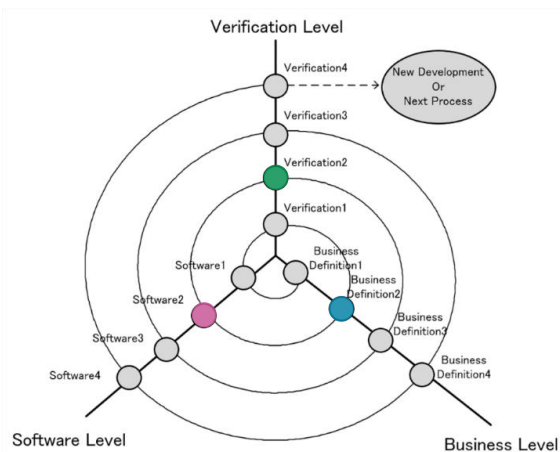
Figure6: Report work and clock out(ChatBot)

The screenshot shows a table titled '出勤記録' (Attendance Record) with columns: 氏名 (Name), 出勤日 (E.Date), 出勤時刻 (E.Time), 退勤日 (E.Date), 退勤時刻 (E.Ti.), and ID. The table contains multiple rows of data representing individual work records.

氏名 (Name)	出勤日 (E.Date)	出勤時刻 (E.Time)	退勤日 (E.Date)	退勤時刻 (E.Ti.)	ID
...	2021年10月12日	08:00:00	2021年10月12日	17:00:00	494
...	2021年10月11日	08:00:00	2021年10月11日	17:00:00	495
...	2021年10月11日	08:00:00	2021年10月11日	17:00:00	496
...	2021年10月12日	08:00:00	2021年10月12日	17:00:00	497
...	2021年10月11日	08:00:00	2021年10月11日	17:00:00	498
...	2021年10月12日	08:00:00	2021年10月12日	17:00:00	499
...	2021年10月11日	08:00:00	2021年10月11日	17:00:00	500
...	2021年10月12日	08:00:00	2021年10月12日	17:00:00	501
...	2021年10月11日	08:00:00	2021年10月11日	17:00:00	502
...	2021年10月12日	08:00:00	2021年10月12日	17:00:00	503
...	2021年10月11日	08:00:00	2021年10月11日	17:00:00	504
...	2021年10月12日	08:00:00	2021年10月12日	17:00:00	505
...	2021年10月11日	08:00:00	2021年10月11日	17:00:00	506
...	2021年10月12日	08:00:00	2021年10月12日	17:00:00	507
...	2021年10月11日	08:00:00	2021年10月11日	17:00:00	508
...	2021年10月12日	08:00:00	2021年10月12日	17:00:00	509
...	2021年10月11日	08:00:00	2021年10月11日	17:00:00	510

Figure7: "Work Record 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.

The screenshot shows a web form titled '残業申請受付フォーム' (Overtime Request Form). It includes fields for '所属部署' (Department), '氏名' (Name), '承認者' (Approver), and '承認メール' (Approval Email). There are also dropdown menus for '承認' (Approve) and '却下' (Reject).

Figure8: "overtime(work) request System"

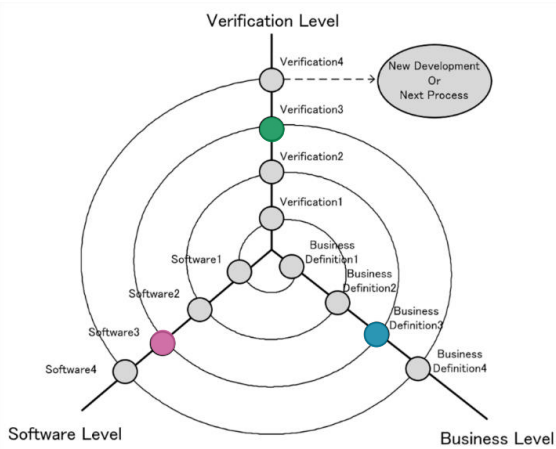


Figure9: Allow/Reject Decision mail.

System Development using Model

Work Record System ver0.3

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



The screenshot shows the "有給申請受付フォーム" (Vacation Request Form) interface. It includes a header with the title, a main content area with form fields and buttons, and a footer with a logo. The interface is designed for users to submit vacation requests.

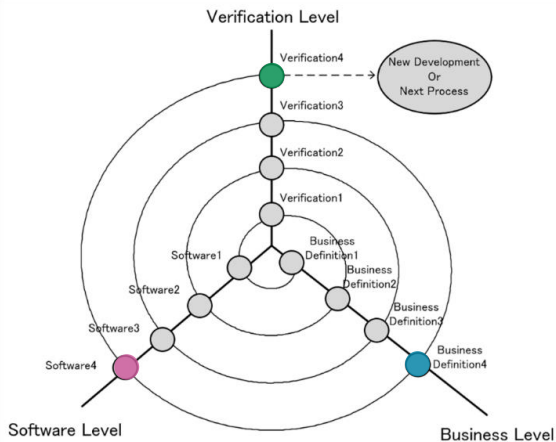
氏名 (Name)	所属 (Group)	メールアドレス (Address...)	申請日 (Date...)	申請内容 (Req...)	申請時間 (Req...)	期間等 (Term)	理由 (Reason)	決裁結果 (Resu...)
山田 太郎	情報企画グループ	...	2021-11-03	半日休暇	0.5		勤務アシスト	承認
山田 太郎	情報企画グループ	...	2021-11-03	一日休暇	1		勤務アシスト	承認
山田 太郎	情報企画グループ	...	2021-11-02	終業休暇	3	1日-3日	勤務アシスト	承認
山田 太郎	情報企画グループ	...	2021-11-01	一日休暇	1		勤務アシスト	承認
山田 太郎	情報企画グループ	...	2021-10-21	半日休暇	0.5		業務対応	承認
山田 太郎	情報企画グループ	...	2021-10-20	一日休暇	1		業務対応	承認
山田 太郎	情報企画グループ	...	2021-10-19	一日休暇	1		勤務アシストのため	承認
山田 太郎	情報企画グループ	...	2021-10-18	終業休暇	2	0時-11時	勤務アシストになりま す。承認の都合よろしく お願いします。	承認
山田 太郎	情報企画グループ	...	2021-10-18	一日休暇	1		勤務アシスト、承認の概 よろしくお願ひください	承認

Figure10: "Vacation Request System"

Figure11: "Vacation Request System" data

Work Record System ver1.0

Using "Power Apps" and "Power BI".



The screenshot shows the "勤務時間入力" (Work Time Input) interface. It features a date and time selector (2022/10/16 11:44:23), a calendar view for October 16, 2022, and buttons for "出勤" (Clock In), "退勤" (Clock Out), "残業申請" (Overtime Request), and "休暇申請" (Vacation Request). A "参照 (勤務実績確認)" button is also present.

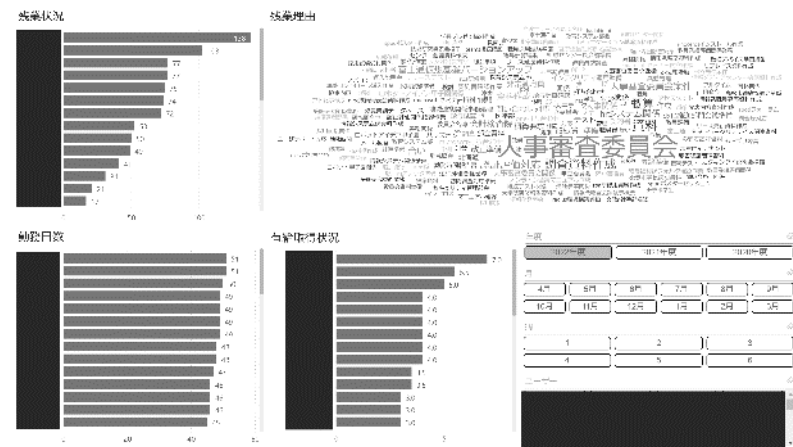


Figure12: "Work Record System" (Powe Apps)

Figure13: Visualization Function(Power BI)

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"?	<ul style="list-style-type: none">• 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"?	<ul style="list-style-type: none">• 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".	<ul style="list-style-type: none">• 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.	<ul style="list-style-type: none">• It was easier to share specific issues.• The motivation of the business units made a difference in the results.
Q5: An overall impression.	<ul style="list-style-type: none">• 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"**.

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.