

Handover Anti-patterns

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ABSTRACT

Every organization undergoes personnel changes that induce handover activities. Most business people are familiar with the concept of a handover. Issues with handovers became apparent in Japan in 2007 as many people from the baby Boomer generation retired simultaneously. Although effective handovers are crucial for seamless business operations during personnel changes, the preferable elements for an ideal handover are ambiguous and few researchers have investigated. Our research focuses on anti-patterns, which identify the causes of an inappropriate handover. Paradoxically, the handover anti-pattern allows preferable elements for handover to become clear. Herein we introduce three anti-patterns, which were elucidated from a workshop to collect information about inappropriate handovers.

1. INTRODUCTION

Handover is a process of transferring responsibilities from the predecessor to the successor [1] [2]. Most business personnel are familiar with the concept. Despite its importance, little is known about handover problems and few publications deal with the handover process. One study [2], which investigated core problems of handovers from a developer to the maintainer, mentions that insufficient knowledge is the main handover problem. Moreover, information sharing is a complex problem. Some research has investigated the complexity of information [3], but none has focused on handovers problems due to complexities with information sharing.

In this paper, we focus on informing-sharing problems during a handover. Our goal is to define the preferable elements of a handover. One way to improve a handover is to define the anti-patterns. The term anti-pattern is from Design Patterns. Although design patterns highlight desirable solutions, which are considered to be highly reliable and effective, anti-patterns highlight negative solutions. Anti-patterns provide the knowledge necessary to prevent or recover from undesired situations. Examples of anti-patterns include death march, god class, and vendor lock-in [4]. Herein we propose an approach to elucidate the elements necessary for a preferable handover by defining common handover anti-patterns. That is, handover anti-patterns are maps of dangerous handover scenarios. By using these maps, project managers can prevent an undesirable situation caused by inappropriate handovers and construct organization policies that are reliable and unaffected by personnel changes.

The rest of the paper is organized as follows. Section 2 introduces our anti-pattern template. Each anti-pattern contains five items: name, scenario, main cause, refactored solution, and refactored scenario. Section 3 discusses handover using activity diagrams, class diagrams, and object diagrams. Section 4 extracts three common anti-patterns. Finally, Section 5 concludes this paper and states possible future works.

2. HANDOVER ANTI-PATTERN TEMPLATE

Our description of an anti-pattern has two solutions. The first solution provides an anti-pattern problem, a solution commonly used by organizations but which is ineffective. The second one provides a refactored solution, a strategy to help improving anti-pattern situation.. [5]. Here each handover anti-pattern consists of five items:

- Name
Concise expression of the anti-pattern situation contained in the class diagram
- Scenario
An anti-pattern scenario based on a case study expressed in the object diagram
- Main causes
Description of the anti-pattern causes
- Strategies to prevent and recover from the anti-pattern

To prevent the anti-pattern, the predecessor should apply Strategy A before leaving the post. In case he fails to do that, his successor should apply Strategy B to recover from the anti-pattern. Strategy A is a measure to prevent the anti-pattern situation while Strategy B aims to correct the problem posed by the anti-pattern.

	Measure to prevent the anti-pattern situation	Measure to recover from anti-pattern situation
Predecessor	Strategy A	-
Successor	-	Strategy B

Table 1 Strategies to prevent and recover from the anti-pattern

- Refactoring scenario

This item is based on the anti-pattern scenario and the prevention and recovering strategies. The object diagram describes the effectiveness of a refactored solution

3. HANDOVER MODEL

Handovers involve an information-sharing process. Here we explain this process with model and an example to illustrate handover activities and necessary elements. In addition, we propose a model to define the handover elements.

- Example

Staff A has been working on system X. Staff A, who is leaving this post, is being replaced by Staff B. The handover elements involve:

- Predecessor: Staff A
- Successor: Staff B
- Handover target: Operation of business management system X

Figures 1-3, show our proposed activity diagram, class diagram and object diagram, respectively.

3.1 HANDOVER ACTIVITY DIAGRAM

The handover activity diagram is used to define the handover activities.

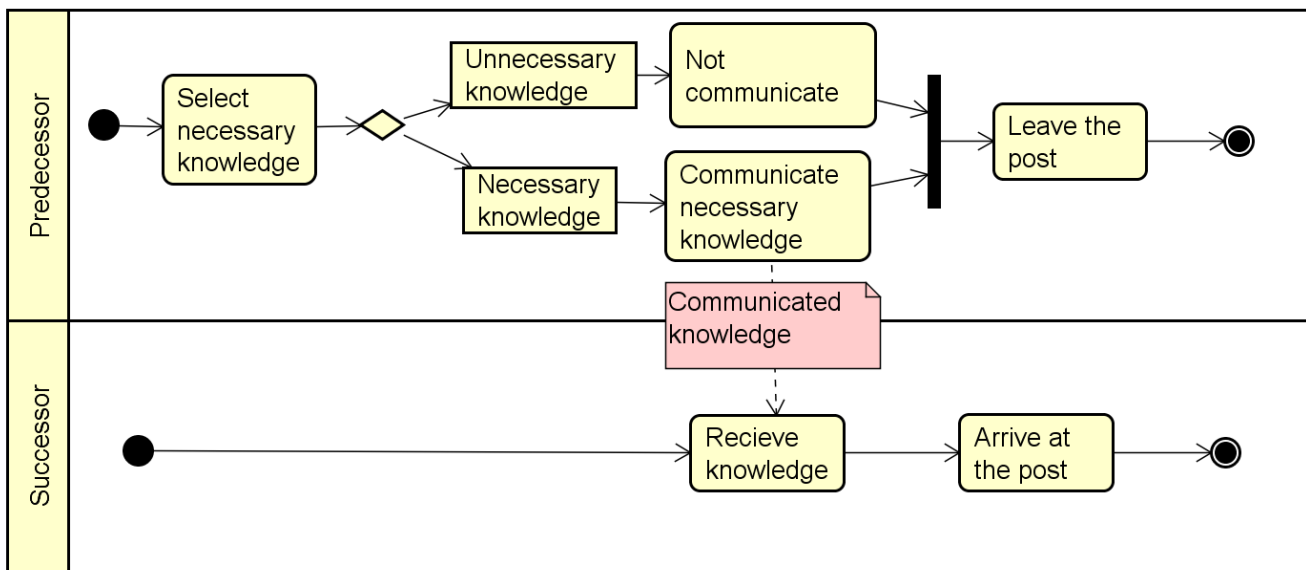


Figure 1 Handover activity Diagram

The handover activities are divided into following tasks:

- (1) Staff A (Predecessor) selects the necessary knowledge and unnecessary knowledge.
- (2) Staff A communicates necessary knowledge to Staff B (Successor).
- (3) Staff B receives the necessary knowledge from Staff A.
- (4) Staff A is replaced by Staff B.

This diagram contains six activities and two actors (Predecessor and Successor) and three activities (Select necessary knowledge, Communicate necessary knowledge and receive knowledge).

3.2 HANDOVER CLASS DIAGRAM

Next we propose a handover class diagram to describe these activities and elements in more detail.

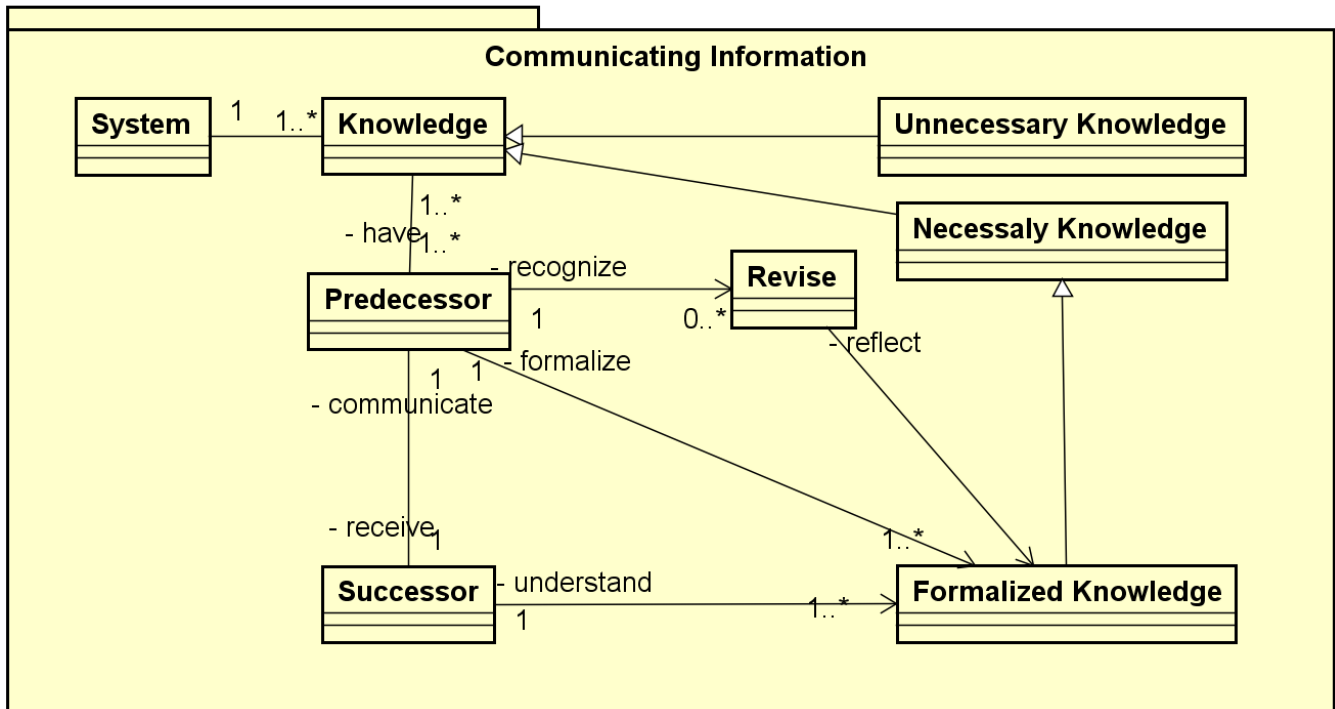


Figure 2 Handover class diagram

There are eight classes in the handover diagram:

- (1) System Class:
 - Target of the Knowledge Class
- (2) Knowledge Class:
 - Knowledge of the System Class owned by the Predecessor Class
 - Two sub-classes: Unnecessary Knowledge Class and Necessary Knowledge Class
- (3) Unnecessary Knowledge Class:
 - Unnecessary Knowledge for the system.
 - Sub-class of the Knowledge Class
- (4) Necessary Knowledge Class:
 - Necessary Knowledge for the system.
 - Sub-class of the Knowledge Class
- (5) Formalized Knowledge Class:
 - Formalized shape of necessary knowledge.
 - Sub-class of the Necessary Knowledge Class.
- (6) Revise Class:
 - Recognized by the Predecessor Class and reflected in the Formalized Knowledge Class.
- (7) Predecessor Class:
 - Communicates necessary knowledge to the Successor Class
- (8) Successor Class:
 - Receives necessary knowledge from the Predecessor Class.

3.3 HANDOVER OBJECT DIAGRAM

We propose the object diagram to complement the class diagram.

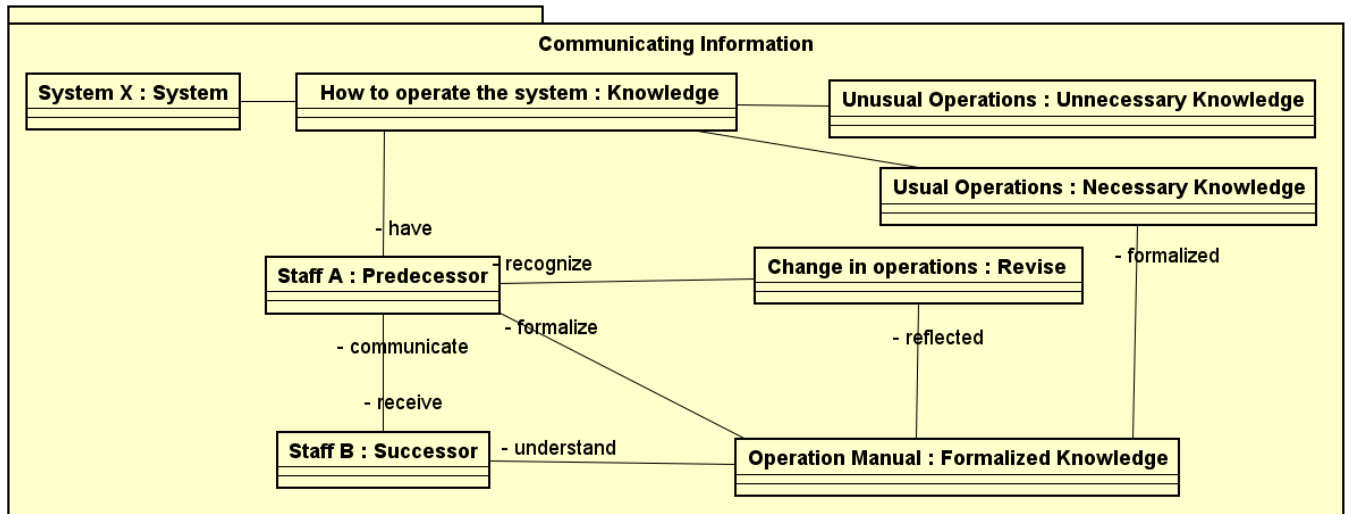


Figure 3 Handover object diagram

The handover object diagram has the following eight classes:

- (1) System X: System Class
- (2) How to operate the system: Knowledge Class
- (3) Unusual operations: Unnecessary Knowledge Class
- (4) Usual operations: Necessary Knowledge Class
- (5) Operation manual: Formalized Knowledge Class
- (6) Change in operations: Revise Class
- (7) Staff A: Predecessor Class
- (8) Staff B: Successor Class

4. HANDOVER ANTI-PATTERN

The handover anti-pattern is classified into two classes. Handover activity consists of two activities, select necessary knowledge, and communicate necessary knowledge. The failures of these activities bring handover anti-pattern. In this section, we introduce three anti-patterns, Unsupported to review, Background is unclear and Necessary knowledge is omitted. These are caused by failure of select necessary knowledge activity.

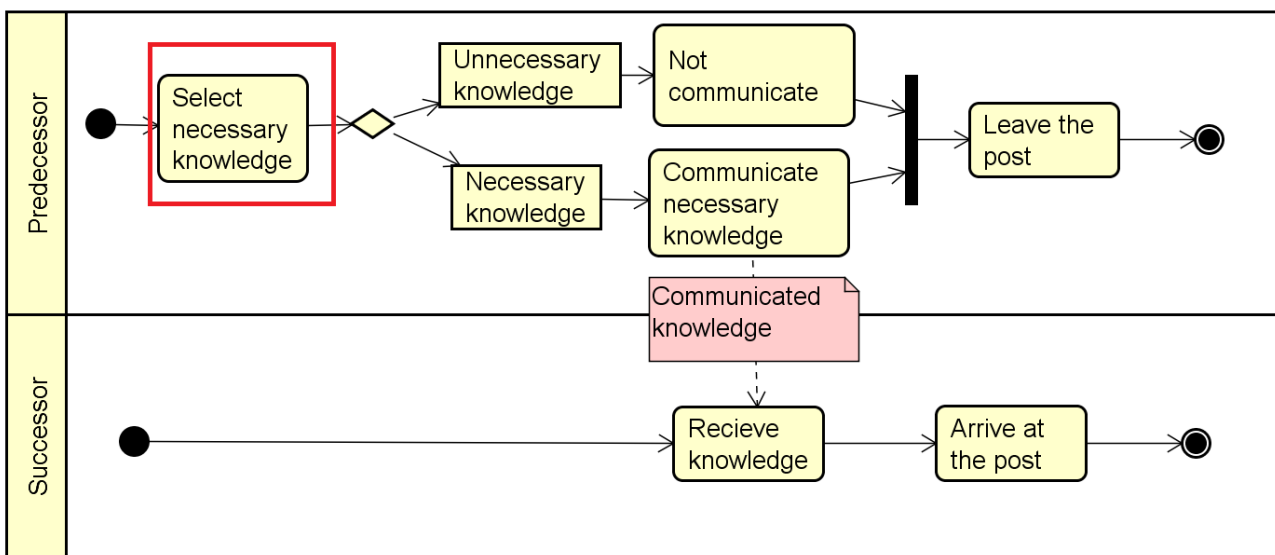


Figure 4 Handover activity map

Failure of the select necessary knowledge activity results in defective knowledge being transmitted. Consequently, predecessor communicates defective knowledge to successor. Defective knowledge has two elements; incorrectness and insufficiency. We explain relationship between these elements and each anti-pattern by map of select necessary knowledge anti-pattern described by class diagram.

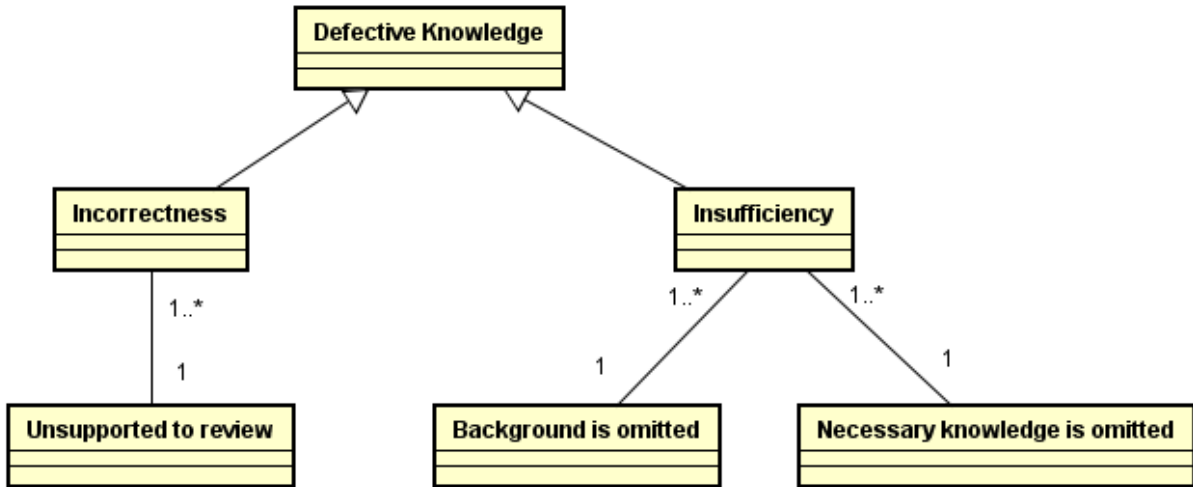


Figure 5 Map of select necessary knowledge anti-pattern

Incorrectness has a relationship between Unsupported to review. Insufficiency has a relationship between Background is omitted and Necessary knowledge is omitted. Next, we explain each anti-pattern in detail from the next section.

4.1 UNSUPPORTED TO REVIEW

A review conference, which denotes defects that must be revised, is an opportunity to correct defects in a document. However, documents are not always revised after a review conference. Sharing unrevised document during the handover process tends to cause issues when the successor assumes responsibility for a task.

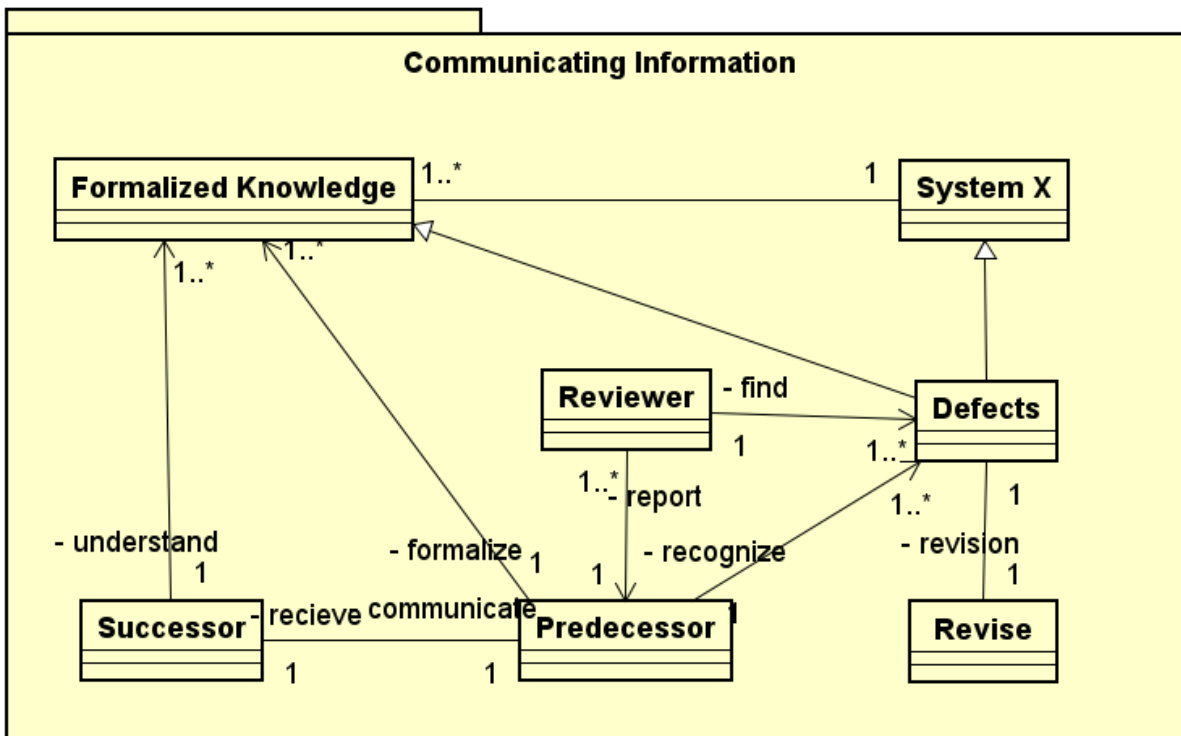


Figure 6 “Unsupported to review” class diagram

- Scenario
 - (1) Staff A is in charge of operations of System X.
 - (2) During a personnel change, Staff B assumes this task from Staff A.
 - (3) Staff A makes operation manual of System X.
 - (4) Staff C reviews the document and find incorrect operation.
 - (5) Staff C reports the defects to Staff A.
 - (6) Staff A recognizes the defects, but does not revise the document.
 - (7) Staff B operates System X using a defective manual and fails to operate System X appropriately.

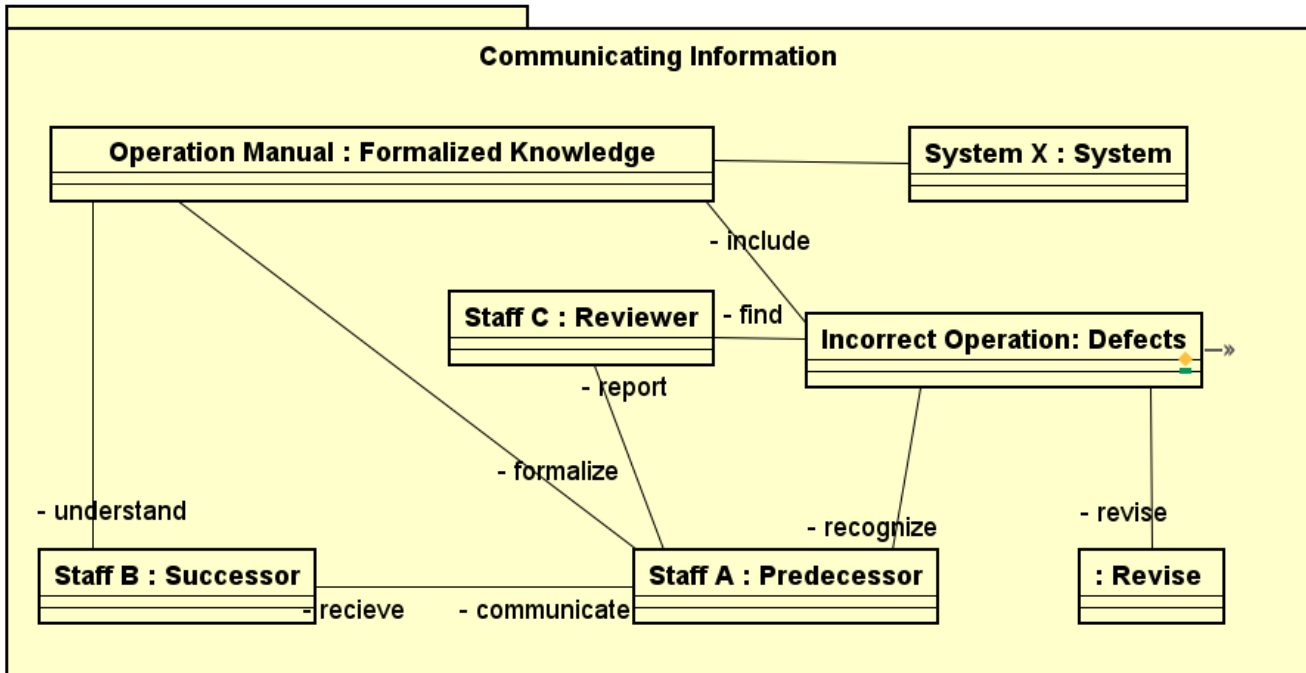


Figure 7 “Unsupported to review” object diagram

- Main cause

This anti-pattern occurs because the predecessor does not revise the documents. Often the predecessor misunderstands the document status and cannot determine whether a document is updated because a method to verify the document status does not exist. Thus, defective document is shared during a handover, preventing the successor from appropriately executing the post.
- Strategies to prevent and recover from the anti-pattern

Because the main cause is the lack of a method to check the documents, introducing an update history of the documents is an effective solution.

	Measure to prevent the anti-pattern situation	Measure to recover from anti-pattern situation
Predecessor	<ul style="list-style-type: none"> Record the update history in the document. Check the status frequently, and update the documents as necessary. 	-
Successor	<ul style="list-style-type: none"> Check the document status before the predecessor leaves, and ask the predecessor if the documents are updated 	-

Table 2 Strategies to prevent and recover from the anti-pattern of “unsupported to review”

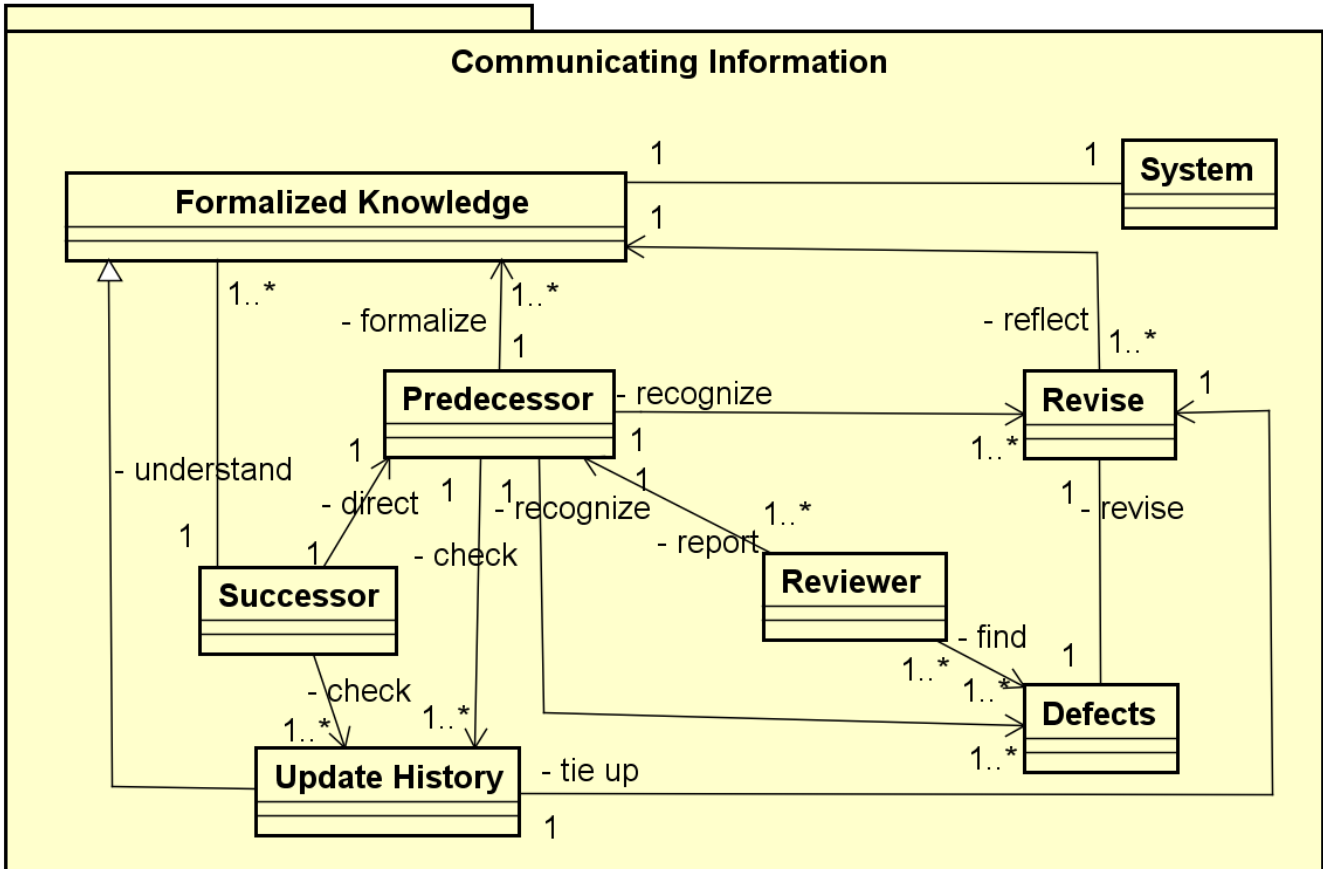


Figure 8 Refactored “unsupported to review” class diagram

- Refactored scenario
 - (1) Staff A is in charge of operations of System X.
 - (2) During a personnel change, Staff B assumes this task from Staff A.
 - (3) Staff A makes operation manual of System X.
 - (4) Staff C reviews the document and find incorrect operation.
 - (5) Staff C reports the defects to Staff A.
 - (6) Staff A recognizes the defects, but does not revise the document.
 - (7) Staff B receives the manual and notes that the document is not updated.
 - (8) Staff A update the documents to remove defects and updates the history.

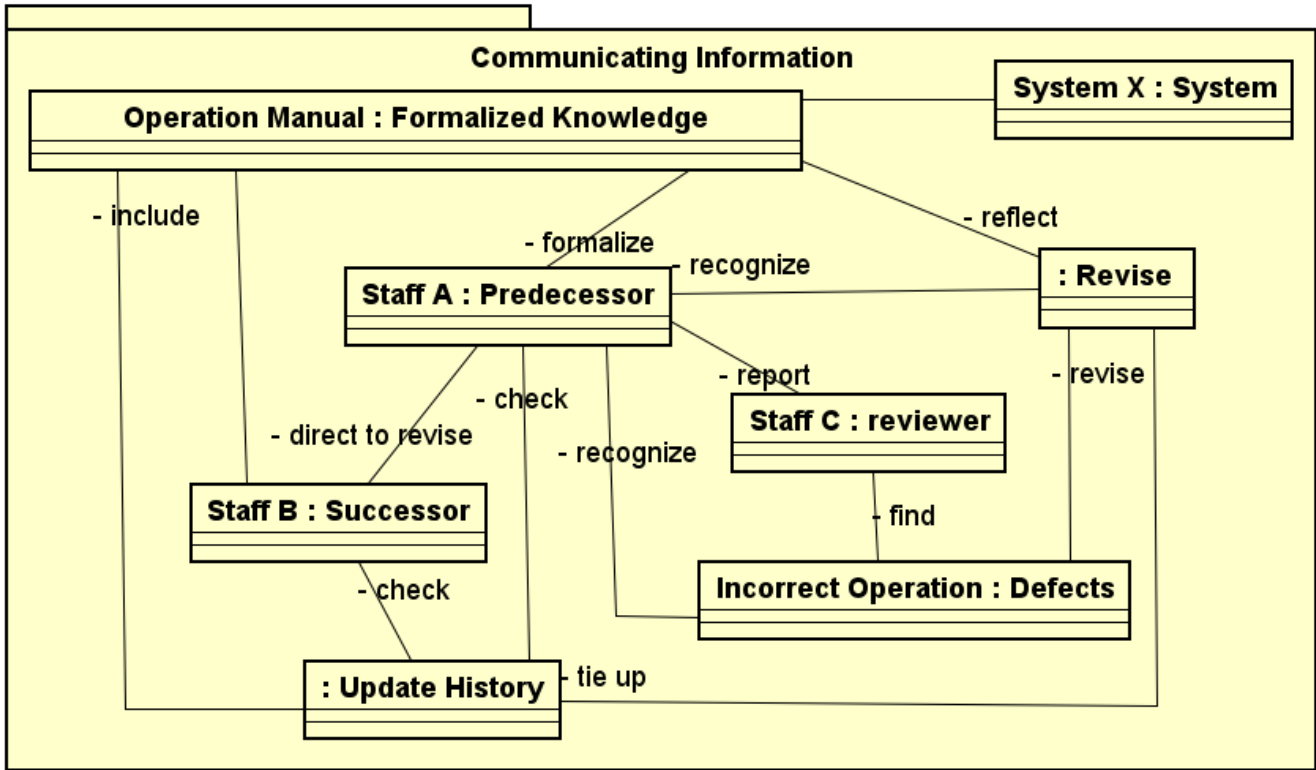


Figure 9 Refactored “unsupported to review” object diagram

4.2 BACKGROUND KNOWLEDGE IS UNCLEAR

All systems have background knowledge such as design concepts, requests from customers, and restrictions regarding budgets or technical levels. Although background knowledge indirectly affects the system, background knowledge tends to be lost because it is not recorded in the handover document.

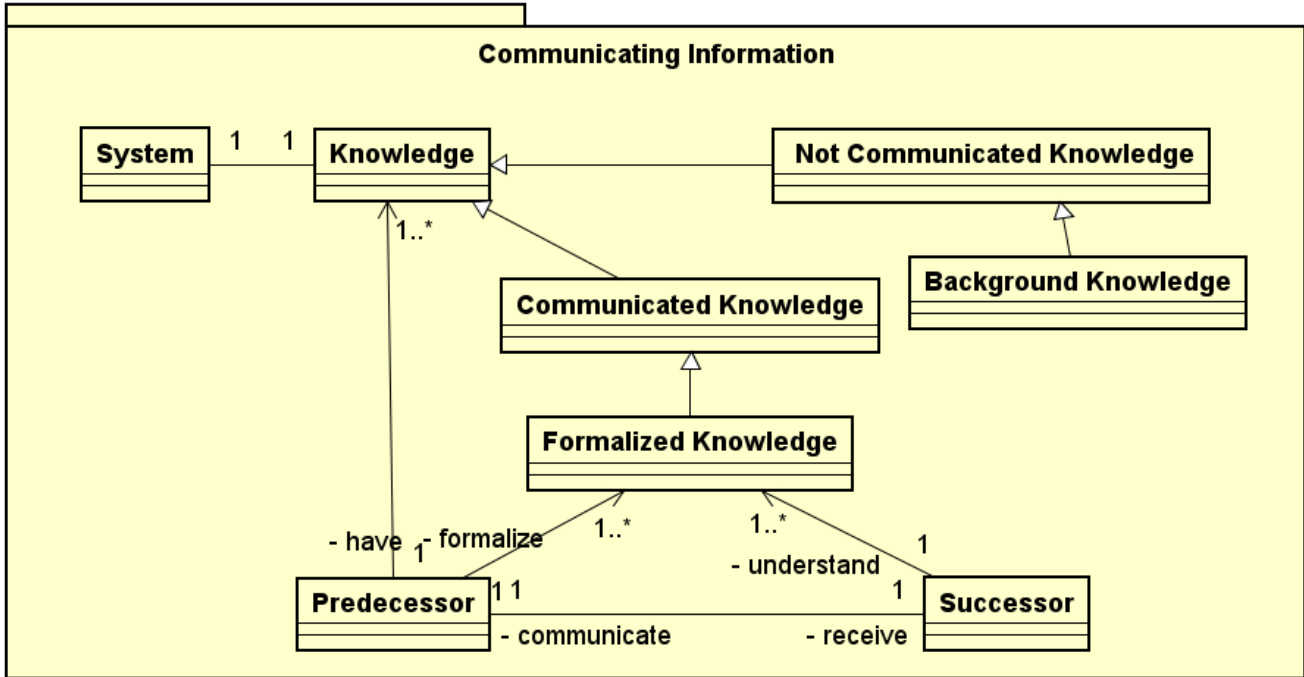


Figure 10 “Background knowledge is unclear” class diagram

- Scenario
 - (1) System X is developed and operated for long periods by Staff A.
 - (2) During a personnel change, Staff B assumes this task from Staff A.
 - (3) After completing the handover, Staff B assumes the post from Staff A,
 - (4) A short time later, Staff B finds an ambiguous output value.
 - (5) The reason for the ambiguity is not present in any of the documents and Staff A is no longer at the company.
 - (6) The background knowledge and know-how to deal with the ambiguous output value are lost.

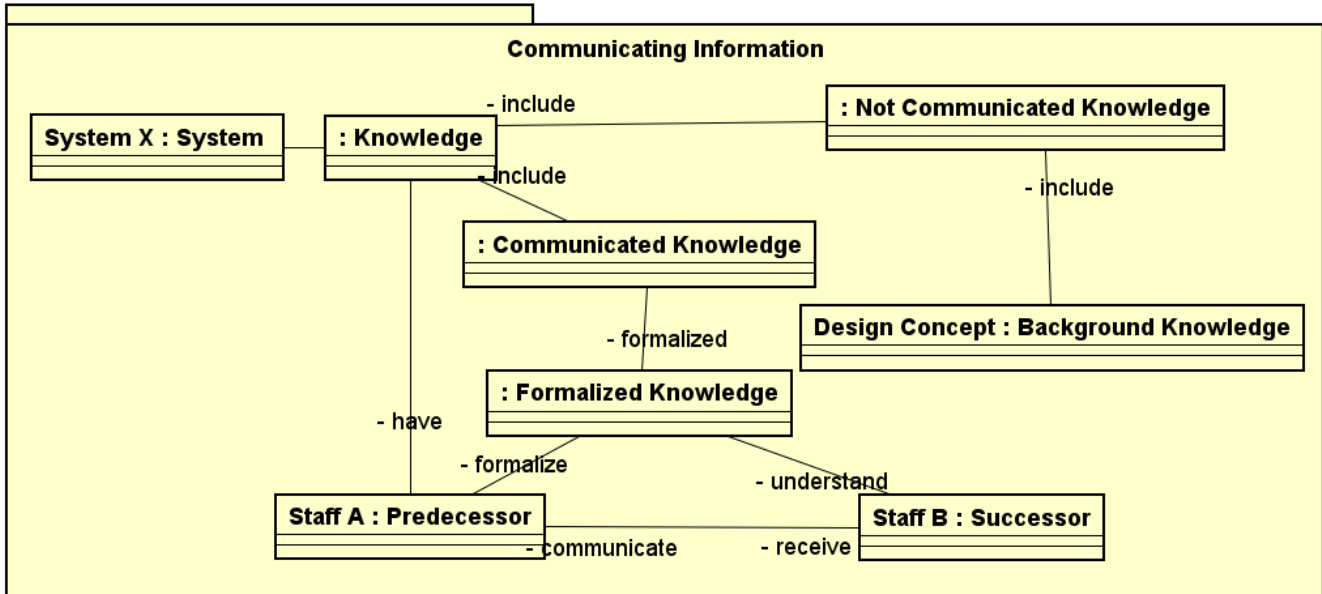


Figure 11 "Background knowledge is unclear" object diagram

- Main causes

Background knowledge affects the system, but it tends to be excluded during a handover, and over time, fewer people understand the background knowledge. Moreover, background knowledge is not recorded in the specification documents.
- Strategies to prevent and recover from the anti-pattern

Background knowledge is not recorded in the specifications. However, the background knowledge is often recorded in other data, such as review of development or the permission of the system because these types of data pertain to the purpose and suitability of the system.

	Measure to prevent the anti-pattern situation	Measure to recover from anti-pattern situation
Predecessor	<ul style="list-style-type: none"> • Preserve the data of the review and the permission. 	-
Successor	<ul style="list-style-type: none"> • Verify that the data of review and the permission exists before the predecessor leaves. 	<ul style="list-style-type: none"> • Trace the data of the review and the permission data, etc.

Table 3 Strategies to prevent and recover from the anti-pattern of "background is unclear"

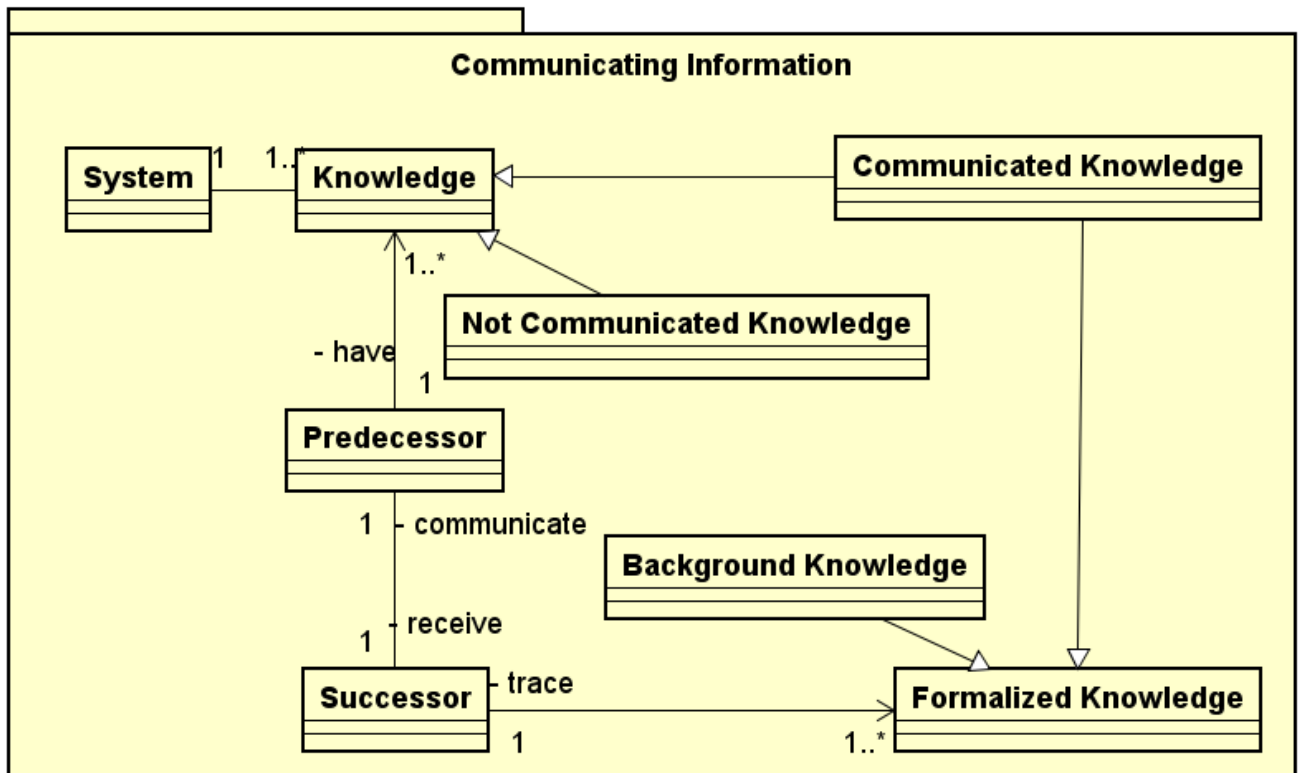


Figure 12 Refactored “background knowledge is unclear” class diagram

- Refactored scenario
- (1) System X is developed and operated for long periods by Staff A.
 - (2) During a personnel change, Staff B assumes this task from Staff A.
 - (3) After completing the handover, Staff B assumes the post from Staff A,
 - (4) A short time later, Staff B finds an ambiguous output value.
 - (5) The reason for the ambiguity is not present in any of the documents and Staff A is no longer at the company.
 - (6) Staff B traces the review data or other data to find the background knowledge of the ambiguous output value.
 - (7) Staff B deals with the output value appropriately.

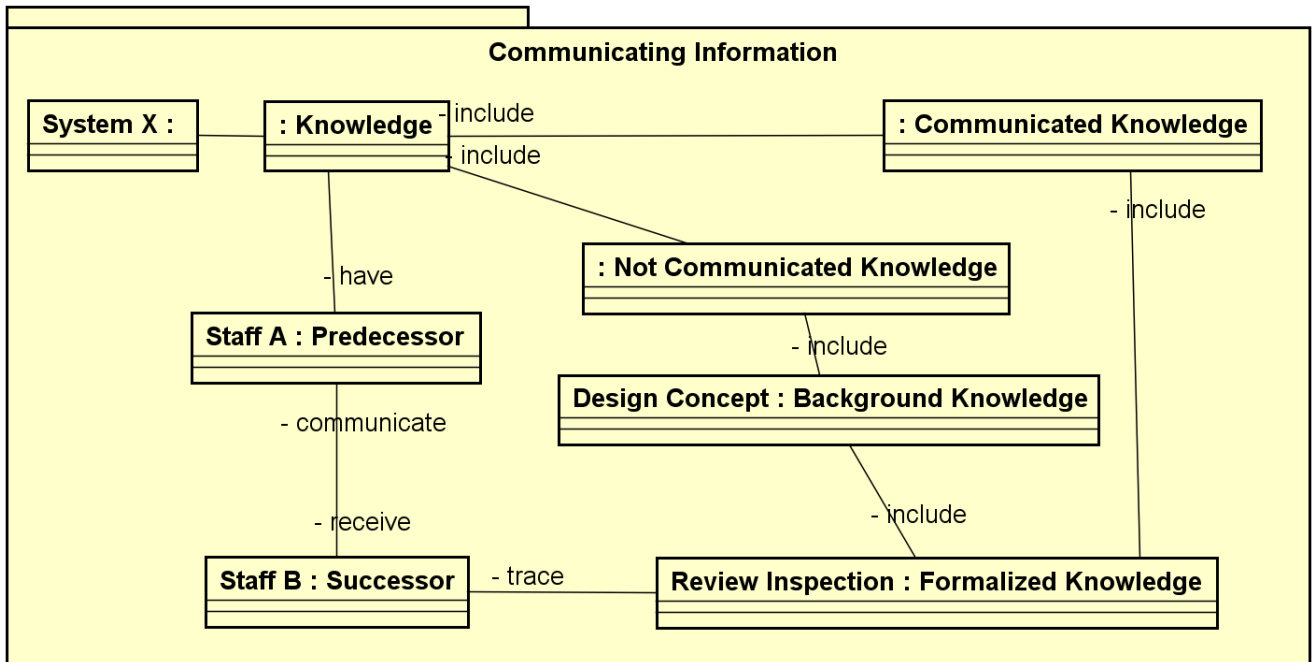


Figure 13 Refactored “background knowledge is unclear” object diagram

4.3 NECESSARY KNOWLEDGE IS OMITTED

The predecessor chooses the necessary knowledge to be shared, and records this information in documents. However, necessary knowledge may be omitted from the handover documents. In this case, omitted necessary knowledge is not passed to the successor, and prevents the successor from appropriately executing the post.

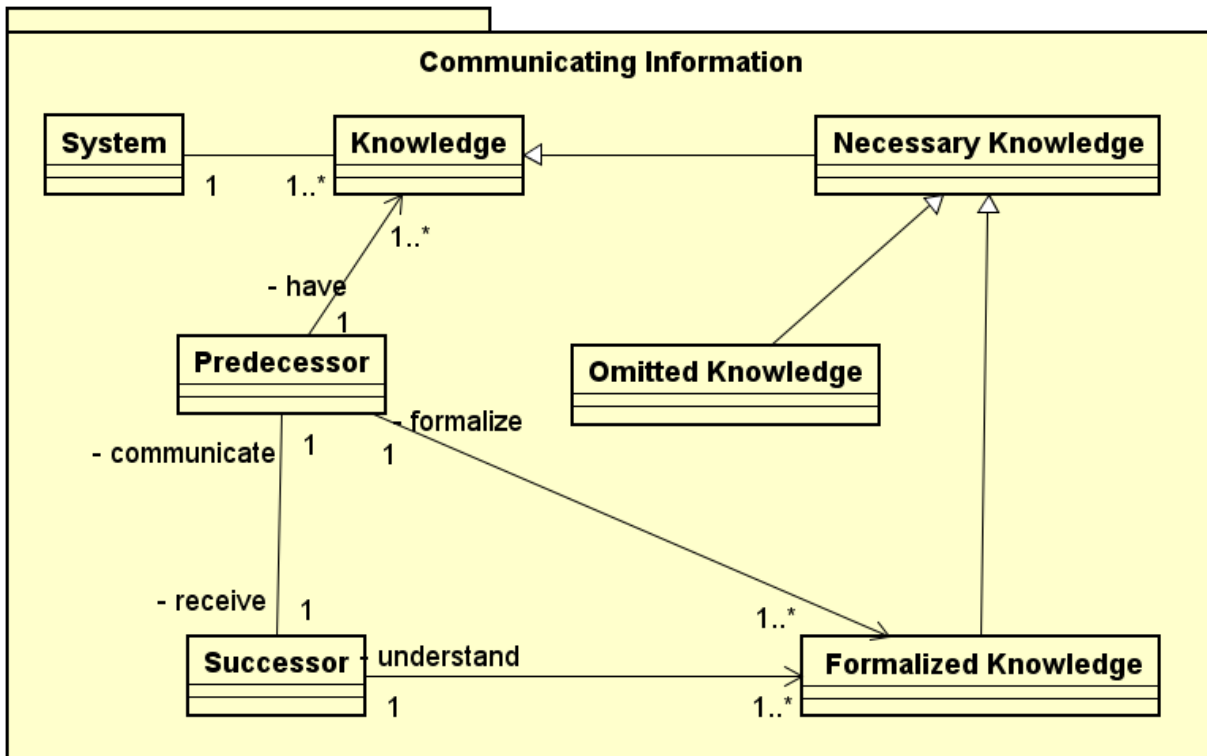


Figure 14 “Necessary knowledge is omitted” class diagram

- Scenario
 - (1) Staff A maintains System X.
 - (2) During a personnel change, Staff B assumes this task from Staff A.
 - (3) Staff A hands over to Staff B for his work, but part of the necessary procedure to back up the system data (operation Y) is omitted from the handover.
 - (4) After completing the handover, Staff B assumes the post from Staff A,
 - (5) A short time later, the backup function of system X gets weaker suddenly and the necessary information is unknown.

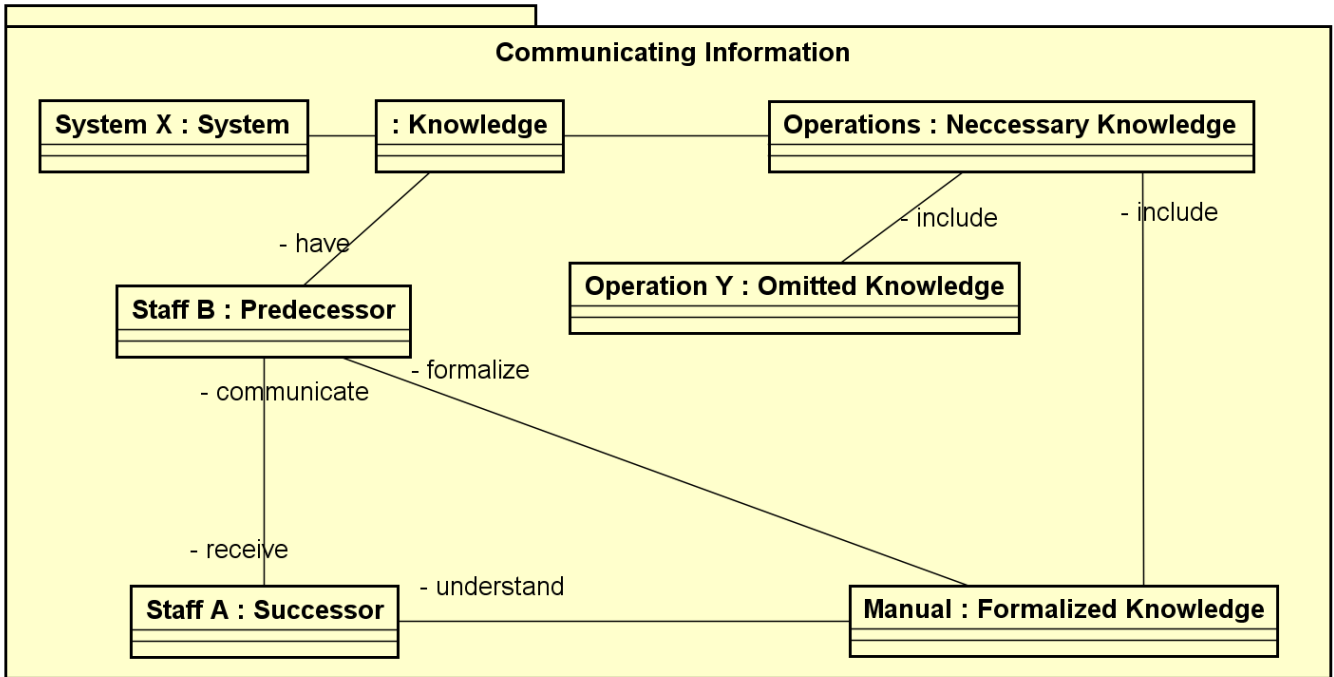


Figure 15 “Necessary knowledge is omitted” object diagram

- Main cause

The absence of a method to verify omitted knowledge objectively is the main cause of this anti-pattern. Although the predecessor verifies whether the handover documents contain all necessary knowledge, a self-check tends to be subjective, making it difficult for the predecessor to determine if knowledge is omitted.
- Strategies to prevent and recover from the anti-pattern

The table below shows effective measures to verify that a handover includes all necessary information.

	Measure to prevent the anti-pattern situation	Measure to recover from anti-pattern situation
Predecessor	<ul style="list-style-type: none"> • Create a checklist for handover items. • Check the list by predecessor himself and a third party. If knowledge is omitted, revise the documents. 	-
Successor	<ul style="list-style-type: none"> • Check the list and if knowledge is omitted, confirm with the predecessor. 	-

Table 4 Strategies to prevent and recover from the anti-pattern of “necessary knowledge is omitted”

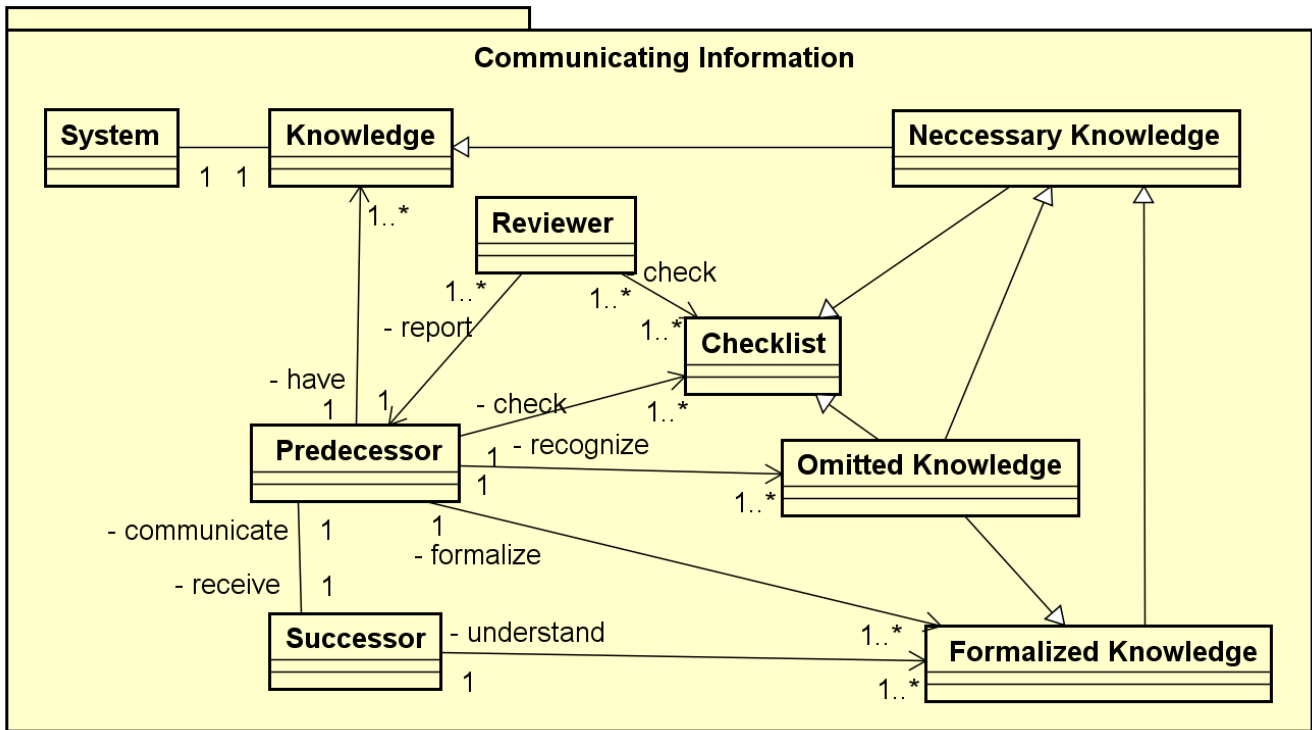


Figure 16 Refactored “necessary knowledge is omitted” class diagram

● Refactored scenario

- (1) Staff A maintains System X.
- (2) During a personnel change, Staff B assumes this task from Staff A.
- (3) Staff A creates a checklist for the handover and then verifies the documents
- (4) Staff A finds that the necessary procedure for the backup is omitted and revises the documents.
- (5) Staff A handovers to Staff B for his work.
- (6) After completing the handover, Staff B assumes the post from Staff A,
- (7) Staff B maintains System X appropriately.

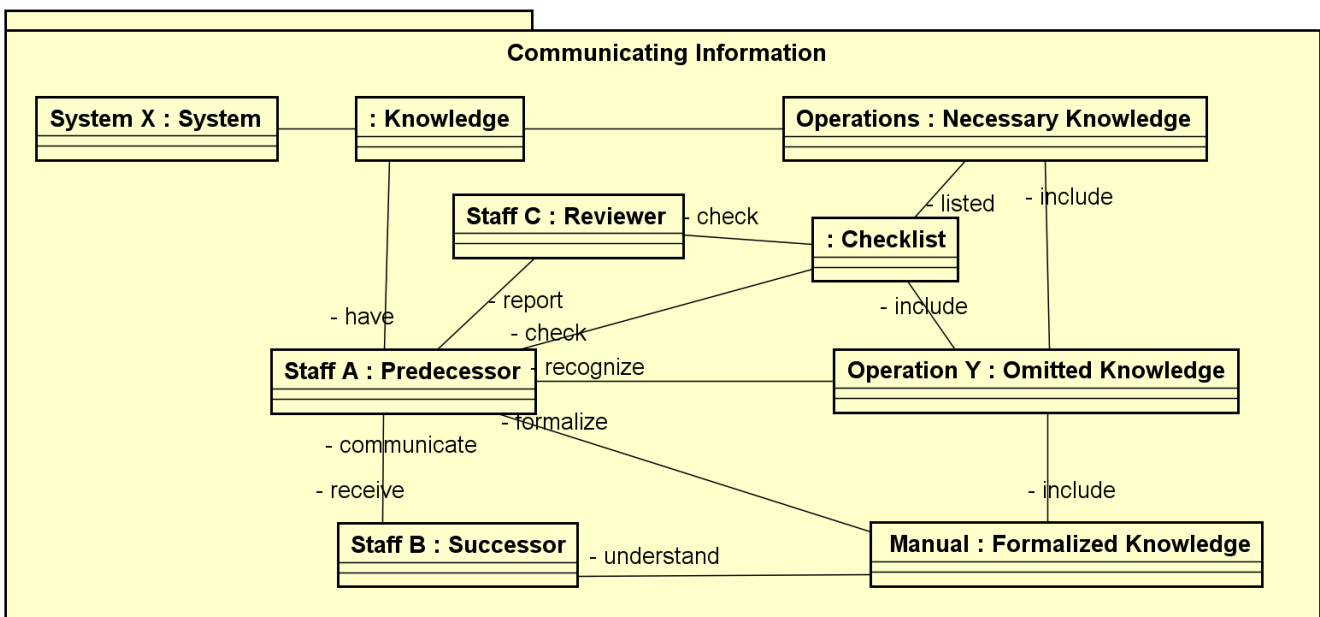


Figure 17 Refactored “necessary knowledge is omitted” object diagram

5. CONCLUSION AND FUTURE WORK

To improve handovers, we propose three models, handover activity diagram, handover class diagram, and handover object diagram. Using these models, we define handover problems and extract three anti-patterns. Each anti-pattern contains refactored solutions to prevent or recover from the anti-patterns situation. The proposed refactored solutions seem to be effective, but effectiveness of those proposed solutions are not verified. This will be one of the future works.

Moreover, we plan to investigate each anti-pattern in more detail and determine their relations. The main purpose of the pattern is to construct the relations between each pattern [6] [7]. As a next step, we propose developing a handover pattern language for an ideal handovers.

6. REFERENCE

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