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Engineering
Center

SPINA³CH

Self-determined Improvement Method

Information-technology Promotion Agency, Japan
Software Engineering Center
Process Improvement WG

Ver.1.00

March 1, 2012

Information-technology Promotion Agency, Japan
Software Engineering Center

Introduction

Software development is a difficult job. You need to think differently from mass production products or tangible products, regarding quality, cost, schedule. On the other hand, you will find it more challenging because of the difficulty.

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"What is the issue of software development from professional software developers?"

Because of this question, a lot of discussions have been done and various supporting tools have been made since software development became an industry separated from university laboratories or computer firms' research department. However, it seems that the perfect solution has not been found yet.

On the whole, many effective mechanisms of software development/operation were built on a technical level to make the development/operation sophisticated. However, they are not always appropriately evaluated or effectively used. SPINA^{3}CH Self-determined Improvement Method provides a mechanism for people who are directly involved in software development to improve their work spontaneously.

March 1, 2012

Information-technology Promotion Agency, Japan, Software Engineering Center

Process Improvement Working Group NPT1 Team

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Ⅰ. In Theory

Ⅱ. In Practice

What is SPINA³CH Self-determined Improvement Method?

It is a mechanism for software developers to improve their work practically.

Usage :
- As an improvement tool for a development team
- As a self-training or self-check tool for an engineer
- As an one of improvements tool for the entire organization

Characteristic: Expects self-help efforts and initiative (both physically and mentally) .
with some helpful clues provided.

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This method provides a tools for a challenge to improve the "way of work" regarding software development practically. The "way of work" is usually called a "process." It means more than a "work procedure." A process includes defining a technological theme (objectives) and the outcome based on the theme, and implementing activities steadily to gain the outcome.

This method can be used in various situations including;

・As an improvement tool for a development team

・As a self-training or self-check tool for an engineer

・As an one of improvement tools for the entire organization

It is worth noting that this method can be addressed by a single person.

This method expects practitioner's self-help efforts and initiative (both physically and mentally), but to make the most of it, some kind of clue, such as predecessors' wisdom and assets, is still needed.

Therefore, this method provides some of those clues through its tools. Through the method, you are encouraged not only to generate ideas for improvement but also to apply them to your work.

Purpose of this Guidebook

Audiences
● Those who want to improve their development. (Project members and leaders)
● Those who want to solve problems with software development. (Process Improvement advocates)

Contents and Usage
● This Guidebook explains how to use the tools of *SPINA³CH* Self-determined Improvement Method
● Consider your situation and align the method with it (investigate, study, and learn).

Problem Awareness Sheet

Study Worksheet
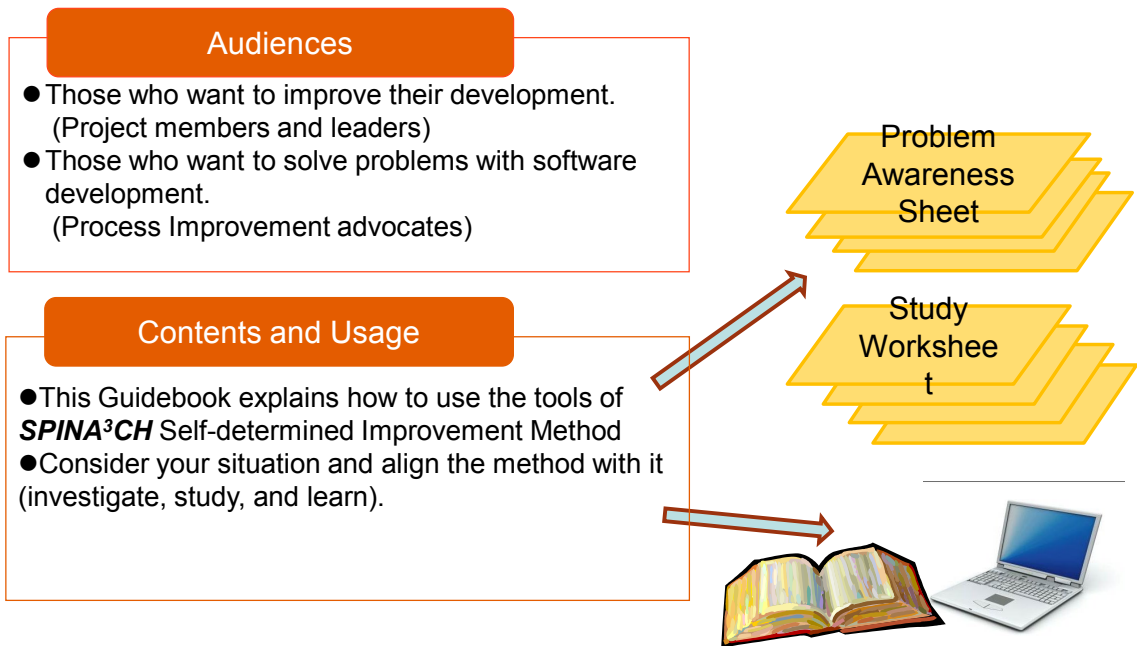
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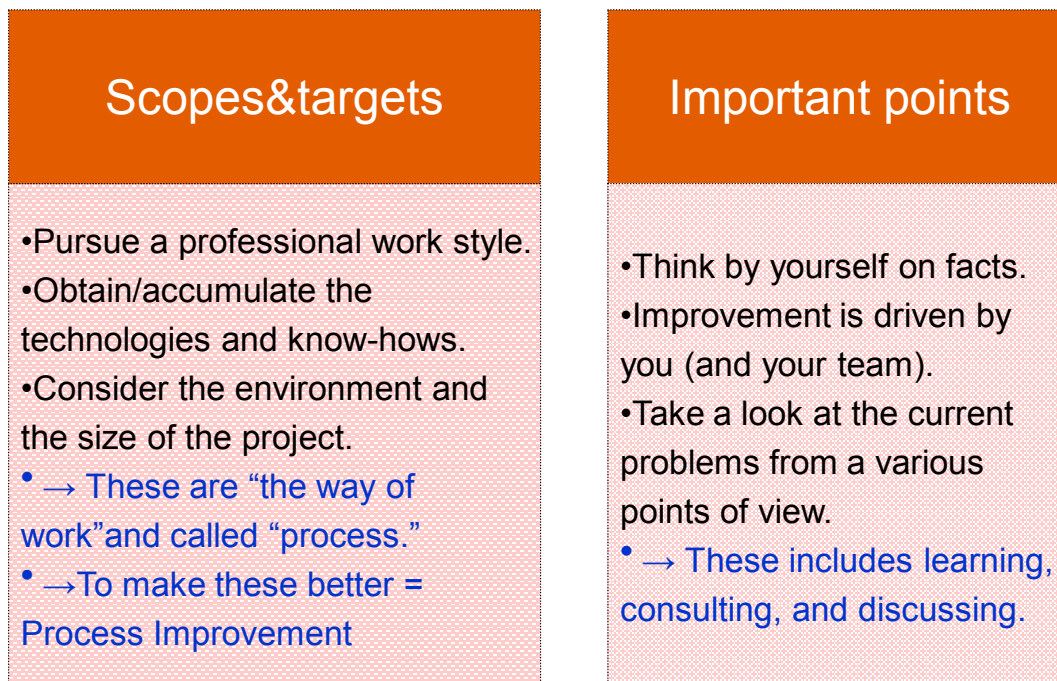This guidebook is for following people.

・Those who want to improve their development (ex. project members, project leaders) ・Those who want to solve some problems with software development (ex. process improvement advocates)

The content and the usage of this guidebook are as follows.

・This guidebook shows the usage of SPINA³CH Self-determined Improvement Method	Shows the recommended usage. The details of each tool are explained later in this book.
・The purpose of this guidebook is for the method to fit to your situation on the actual context.	What is provided is a kind of template, including various sheets. They can be tailored as appropriate, however before doing so, it is important to refer to some literatures and/or internationally recognized process assessment and improvement models, such as ISO/IEC 15504, 33K series and CMMI so that the tailoring should not be made by only local experience or irresponsible ideas to just satisfy yourself.

Roadmap for creating a better way of work

Scopes&targets	Important points
•Pursue a professional work style. •Obtain/accumulate the technologies and know-hows. •Consider the environment and the size of the project. • → These are "the way of work"and called "process." • →To make these better = Process Improvement	•Think by yourself on facts. •Improvement is driven by you (and your team). •Take a look at the current problems from a various points of view. • → These includes learning, consulting, and discussing.

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To improve the way of work, there are some points to remember.

The scopes for improvement are as follows.

・Work style (Pursue a professional work style).

A professional work style gives you pride, and in business sense, it means a work style which generates better results than other firms. Pursue these styles.

・Technology and know-how (Accumulate and make use of them).

Accumulating and making use of technologies and know-hows makes the work more professional and effective. This accumulation helps team or organization to improve the overall competence you belong to. It could also be helpful for customer and end-user services.

・Tailoring (Tailor the way of work suitable for the work environment).

Consider the context of the project, such as environment and size, so that the way of work in practice should be suited for the context. In software development, the same procedure cannot always be applied every time. Be flexible depending on each project context and make tailoring appropriately. Accumulating technologies and know-hows is also useful for doing this.

Important points on advocating improvement

・Understand the current situation from various points of view: find records, collect facts and information, and listen to your seniors, colleagues, and bosses.

・Think by yourself: the best way to deal with problems is to consider problems in the context.

・Choose improvements that can be made by yourself: improvement won't be done forever if you let someone else in charge or blame someone else. It is you who should take the initiative.

・Be open to learn and coordinate: "just thinking in your head" makes you stack. Learn Information Technology and software engineering technologies to solve problems/issues, organize the accumulated know-how within the organization, and if needed, persuade the people involved or ask them to cooperate.

＜column＞ Analogy ： Improvement of the family budget by the housekeeping book

In the general discussion of the process improvement, only the framework of improvement is discussed. It is similar to keep household accounts in order to improve the situation of the family budget. If you want to actually improve the situation much more, specific discussions are needed, such as; "Which spending should be saved", "Which car should be bought for the next one", "What should we think the child's part –time job " etc: on the actual improvement.

Improvement cannot be expected only by keeping consistency on the housekeeping book.

Tools for SPINA³CH Self-determined Improvement Method

SPINA³CH Self-determined Improvement Method uses the following mechanism and certain tools.
- Find "facts" of the development scene and <u>aware</u> "problems" in it.
- Find <u>notable points.</u>
- Consider pros and cons of the current process.
- Understand <u>the cause of the problem</u> and <u>where to improve</u>.
- <u>Compare</u> with best practices or those of other organizations.
- <u>Learn</u> software development techniques and management techniques
- <u>Study</u> the usage of tools and <u>evaluate</u> them.
- Deliberate the above and make <u>an action plan.</u>
- Accumulate and reorganize knowledge.

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SPINA³CH Self-determined Improvement Method takes the following steps with certain tools.

・Find "facts" of the development scene and aware "problems" in it.

In order to see problems from various perspectives, utilize "Problem Awareness Sheet" in your specific development scene.

・Find notable points.

Look the extracted problems closely, clarify the cause and effect, and focus where improvement will be made considering their original causes, levels of importance, or priorities.

・Consider pros and cons of the current processes.

Write down objectively your present approach toward the problems of the selected processes. Be aware that the approach can be seen both good and bad depending on the position of the person looking at it.

・Understand the cause of the problem and where to improve.

Extract improvable points on your current way of work in accordance with the focused results (notable points).

・Compare with best practices or those of other organizations.

On considering an action solution, refer to some real good examples (that is called), or the solution of other organizations.

・Learn software development techniques and management techniques.

It is more effective to refer to theoretical studies, techniques, and advanced cases.

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・Study the usage of tools and evaluate them.

Some solutions proactively use software supporting tools or supporting environments. It is better to evaluate their effectiveness.
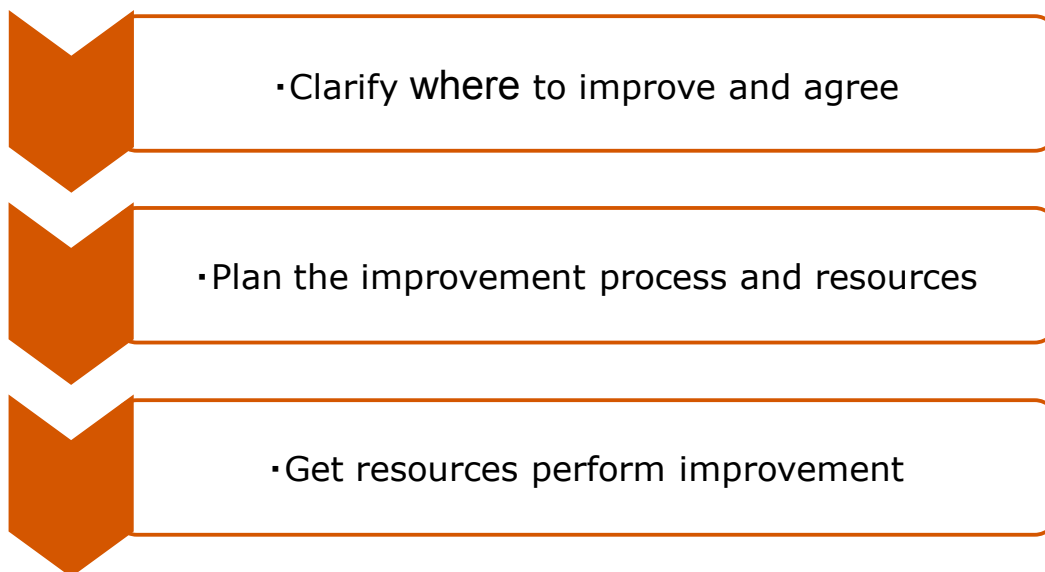
・Make an action plan.

Summarize various improvement ideas into an actual action plan and share it with people involved.

・Accumulate and re-organize knowledge.

All the written completed forms of the tools made within the steps are valuable information, which concisely show you the current condition of your working process and where improvement is needed concisely. It is important to store them for future use.
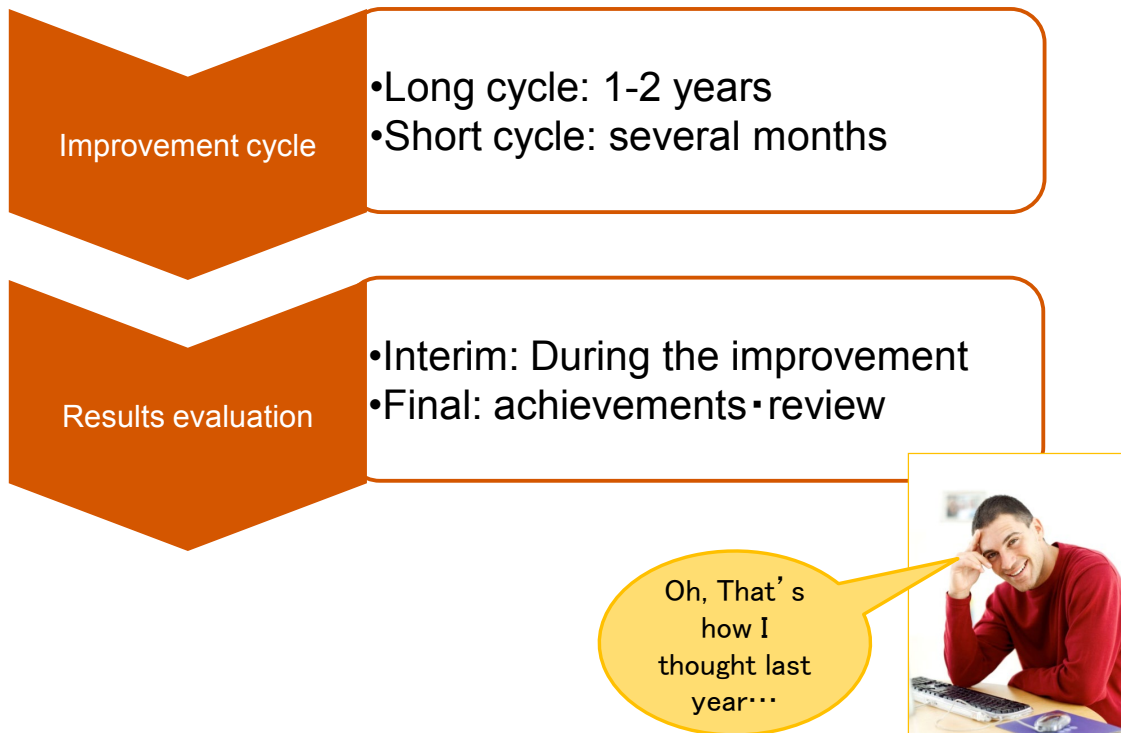
Stepping out for actual improvement

·Clarify **where** to improve and agree

·Plan the improvement process and resources

·Get resources perform improvement

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SPINA[3]CH Self-determined Improvement Method emphasizes not only on extracting suggestions for improvement but also on actually stepping out for improvement.

To step out, it is also important to agree with relevant team, senior manager and other stakeholders. It might be required to be shared current condition of the process, the states of the act in the world.

A plan made with a speed-before-quality policy is low feasibility and, it might end up just leaving bad influences behind. When making a plan, it is recommended to have a long-term prospect and ensure obtaining effects constantly. It may be worth considering choosing a pilot project, beginning on a small scale at first and then deploying it to other departments step by step.

To execute actual improvement, clarify where and how the improvement should be made on the current process, estimate essential resources (hardware and/or software facilities, staff working time, etc.) and ensure the process change procedure and the implementation date.

Sustainable improvement

Improvement cycle	•Long cycle: 1-2 years •Short cycle: several months
Results evaluation	•Interim: During the improvement •Final: achievements・review

Oh, That's how I thought last year…

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Improvement cycle

There are various ideas concerning how to improve. And ways to implement vary depending on situations. If the improvement policy is to make accessible things improved step by step, it is effective to visualize small but specific outcomes in several months cycle. If the policy is to change a whole department institutionally or to introduce a new technological method, it may be better to assume that the improvement cycle will take 1–2 years. Your experiences help to select the way of improvement. You have to make an effort to obtain effects surely in the case of long–term cycle improvement; for example, effects should be checked at several milestones to readjust course of actions accordingly.

Results evaluation

Achievements (improvement results) should be "evaluated" explicitly. Improvement is not always directly–connected to the positive earnings of the organization. It could lead the organizational performance steadily. And when a new method is introduced, temporary performance depression can be seen often. These possibilities must be noted, but improvement should be done to obtain objective results. When the performance looks depressed, consider "why." This will be a good starting point for new improvement. When a completely different method or approach is taken, frequent interim–evaluations and appropriate modifications are advisable.
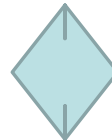
The relationships with SPEAK-IPA and CMMI®

Which area needs improvement?
- Focus the area

Aligned with assessment models
- Adopt broad perspective

CMMI

IPA-SEC
SPEAK-IPA

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SPINA³CH Self-determined Improvement Method was built concerning the relationships with SPEAK-IPA model or CMMI® developed by Carnegie Mellon University.

Model-based approaches such as SPEAK-IPA model or CMMI expect a comprehensive approach covering entire life cycles.

On the other hand, SPINA³CH Self-determined improvement Method is for a pinpointed approach which identifies areas where ideal outcomes are highly likely obtained and implements improvement actions appropriate for the areas.

In other words, SPINA³CH Self-determined Improvement Method "focuses" on the effectively improvable areas to obtain ideal outcomes.

This method includes a tool (Study Worksheet) to select appropriate improvement solution and the tool is used in conjunction with assessment models (PAM and PRM). Assessment models provide multifaceted perspectives, and by using the perspectives to complement any substantive "missing piece," the improvements are more likely to obtain the ideal outcomes.

Characteristics of **SPINA³CH** Self-determined Improvement Method(1/4)

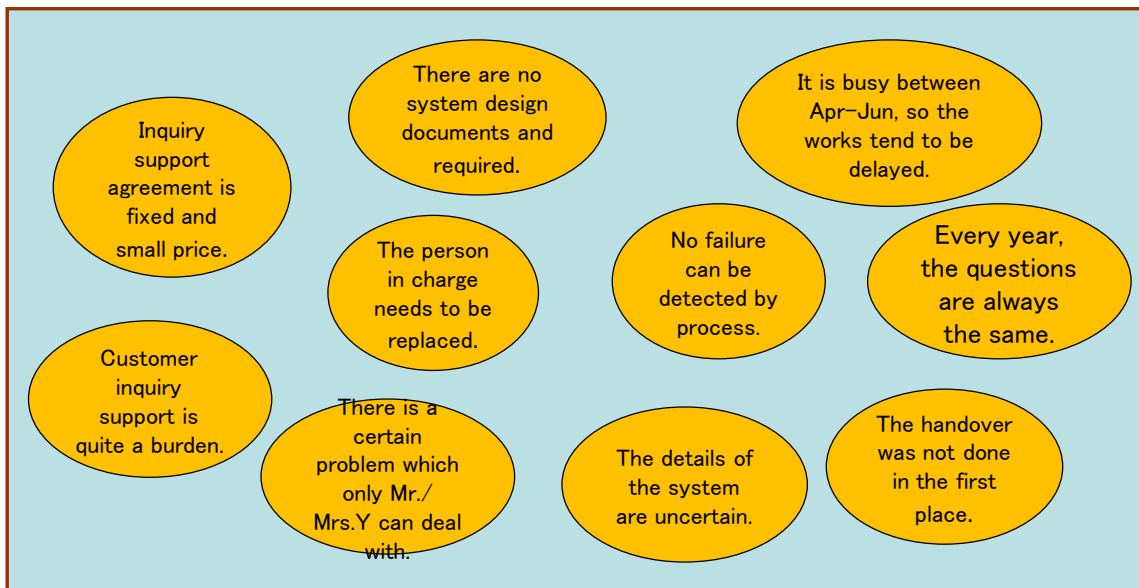Integrate model-based improvement and issue-based improvement

	Issue-based	Model-based
Common pitfalls	●Your focus is solely on the burning issue and therefore lack comprehensiveness. ●Always just firefighting, because it's difficult to provide preventive measures	● So many practices are shown at a time that it alienate people on the line. ●Achieving a certain capability level becomes the top priority. ●As tending to implement the model itself, and it may become a burden to people on the line. ●SEPG tends to take initiative without the people on the line.
Potential benefits	●Easy to address for a beginner. ●Quick tangible improvement results can be obtained.	●The definition of software development processes can be made comprehensively.

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Roughly speaking, the main characteristic of SPINA³CH Self-determined Improvement Method is integration of model-based improvement and issue-based improvement.

Issue-based improvement starts with focusing on specific troubles or problems on current "way of work" and improves it for achieving higher objectives.

Model-based improvement compares one's processes with a process model or process capability model which contains notable points comprehensively, then correct failed or insufficient parts of one's processes.

Characteristics of **SPINA³CH** Self-determined Improvement Method(2/4)
## Various situations/problems/requests (a certain organization's case)

Inquiry support agreement is fixed and small price.

There are no system design documents and required.

It is busy between Apr-Jun, so the works tend to be delayed.

The person in charge needs to be replaced.

No failure can be detected by process.

Every year, the questions are always the same.

Customer inquiry support is quite a burden.

There is a certain problem which only Mr./Mrs.Y can deal with.

The details of the system are uncertain.

The handover was not done in the first place.

Identify these situations and analyze the issues.

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SPINA³CH Self-determined Improvement Method starts from the issue-based approach. First, think of the specific problems around you, like the above, and provide corroborative evidences for them.

In this part, model-based approach is not used, so you do not have to apply a "model" to your situation to find problems. Rather, you have to use specific tools to clarify the problems of your work based on the facts related to relationships within your team, with customers, with end-users and within the organization as well as organizational situations.

Characteristics of **SPINA³CH** Self-determined Improvement Method(3/4)
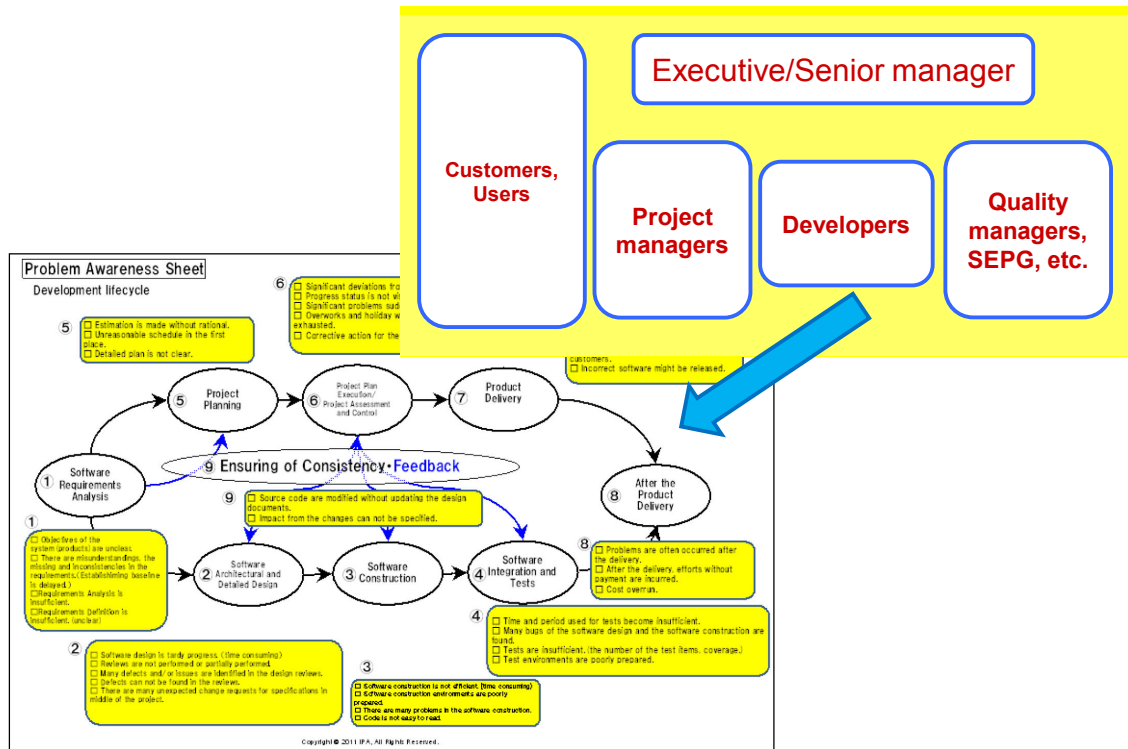
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SPINA³CH Self–determined Improvement Method focus on not only the developers but also other relevant people such as customers or senior managers to find any gap between their expected work styles or works and their realities. As a first step, use "Problem Awareness Sheet" which focuses on development work. "Problem Awareness Sheet", as above, shows a rough workflow of a development work. This sheet helps you to find out your real problems and then analyze and organize them.

Characteristics of **SPINA³CH** Self-determined Improvement Method(4/4)

	Processes of assessment model; SPEAK-IPA (for developers and so on)	

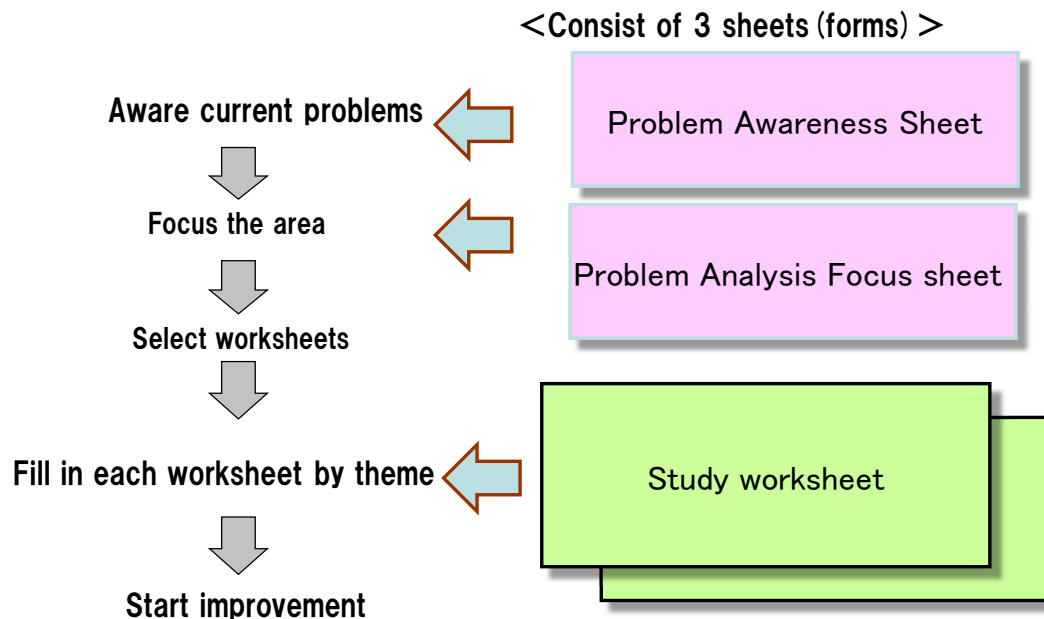| category	group	process
Primary life cycle process category	Customer-supplier process group	•P.1.1 acquisition preparation process •P.1.2 supplier selection process •P.1.3 supplier monitoring process •P.1.4 customer acceptance process
	Engineering process group	•P.2 supply process •P.3.1 requirements elicitation process •P.3.2 system requirements analysis process •P.3.3 system architectural design process •P.3.4 software requirements analysis process •P.3.5 software design process •P.3.6 software construction process •P.3.7 software integration process •P.3.8 software testing process •P.3.9 system integration process •P.3.10 system testing process •P.5 maintenance process
Supporting life cycle process category	Supporting process group	•S.1 documentation process •S.2 configuration management process •S.3 quality assurance process •S.4 verification process •S.5 validation process •S.8 problem resolution process
Organizational life cycle process category	Management process group	•O.1.3 project management process •O.1.4 quality management process •O.1.5 risk management process
	Organizational process group	•O.1.1 organizational alignment process •O.1.2 organizational management process •O.1.6 measurement process •O.4.1 human resource management process •O.4.2 training process •O.7 domain engineering process

Focus

Think by yourself

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Everyone concerned has many individual problems.

Extract problems extensively by collecting at these problems and issues, and then select the problems to be tackled with. The table above shows the entire processes of SPEAK-IPA. Any problem or issue could be included in the processes somewhere, but full-scale improvement is not necessary. Consider the cause and effect of each problem to focus accessible themes that can be improved more effectively.

In this step, it is important to identify where to focus and improve considering the current situation and the context around you.

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Tools of **SPINA³CH** Self-determined Improvement Method

＜Consist of 3 sheets（forms）＞

Aware current problems ⟵ | Problem Awareness Sheet

Focus the area ⟵ | Problem Analysis Focus sheet

Select worksheets

Fill in each worksheet by theme ⟵ | Study worksheet

Start improvement

Tools, on the whole, are to navigate process improvement using forms.

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SPINA³CH Self-determined Improvement Method has two phases on improving a process.

−The first phase; Aware (extract) and focus the problems.

−The second phase; Organize the knowledge using Study Worksheet, develop ideas and consolidate an action plan.

Following working sheets (forms) are used;

 （1）Problem Awareness Sheet

 （2）Problem Analysis Focus Sheet

 （3）Study Worksheet (front side)

 （4）Study Worksheet (flip side)

（4）Provides technical information which can be helpful for filling in（3）.

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SPINA³CH Self-determined
improvement Method
in Practice

From now on, let us explain the usage of SPINA³CH Self–determined Improvement Method.

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How to use

- STEP1：Use "Problem Awareness Sheet" to roughly check the problems occurring in the development life cycle.
- STEP2：Explore problems more closely and analyze the causal relations.
- STEP3：Focus the area of improvement.
- STEP4：Select relevant Study worksheet.
- STEP5：Fill in Study Worksheet so that you could find solutions by yourself .

- STEP6：Get a better grasp through discussions with team members and specialists.
- STEP7：Apply results of study for improvement.
- STEP8：Conduct review.
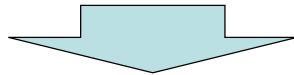
In Step 8, recheck the results of step1-7 and reflect to the next improvement cycle.

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There are 8 steps in total. STEP 1 through STEP 5 include problem awareness, analyzing and considering improvement actions. STEP 6 and STEP 7 explore the improvement actions considered in the previous steps and change the "way of work". And STEP 8, the final step, review the results and the activities taken in the previous seven steps and reflect to the next improvement cycle.

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Tools to prepare

- ● Problem Awareness Sheet
- ● Problem Card
- ● Problem Exploration Samples
- ● Problem Analysis Focus Sheet
- ● Theme Mapping Lists
- ● Study Worksheet

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Here are tools used in SPNACH Self-determined Improvement Method.

○Problem Awareness Sheet

Problem Awareness Sheet is used in STEP1 to roughly check problems occurring in the field.

○Problem Card

Problem Card is used with Problem Awareness Sheet to identify any problem which could occur in any development process.

○Problem Exploration Samples

This is a collection of clues to explore the problems on Problem Cards.

○Problem Analysis Focus Sheet

Arranging the selected Problem Card(s) on this blank sheet and if needed, some more exploration could be allowed (some more information could be added). This is used to analyze the cause and effect and to focus the improvement area.

○Theme Mapping Lists

Use this list as a reference to select the relevant Study Worksheet.

○Study Worksheet

This is used to study the current situation of the focused area, improvable problems and improvement solutions, and used for promoting improvement activities.

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STEP1: Use "Problem Awareness Sheet" to roughly check the problems occurring in the development life cycle
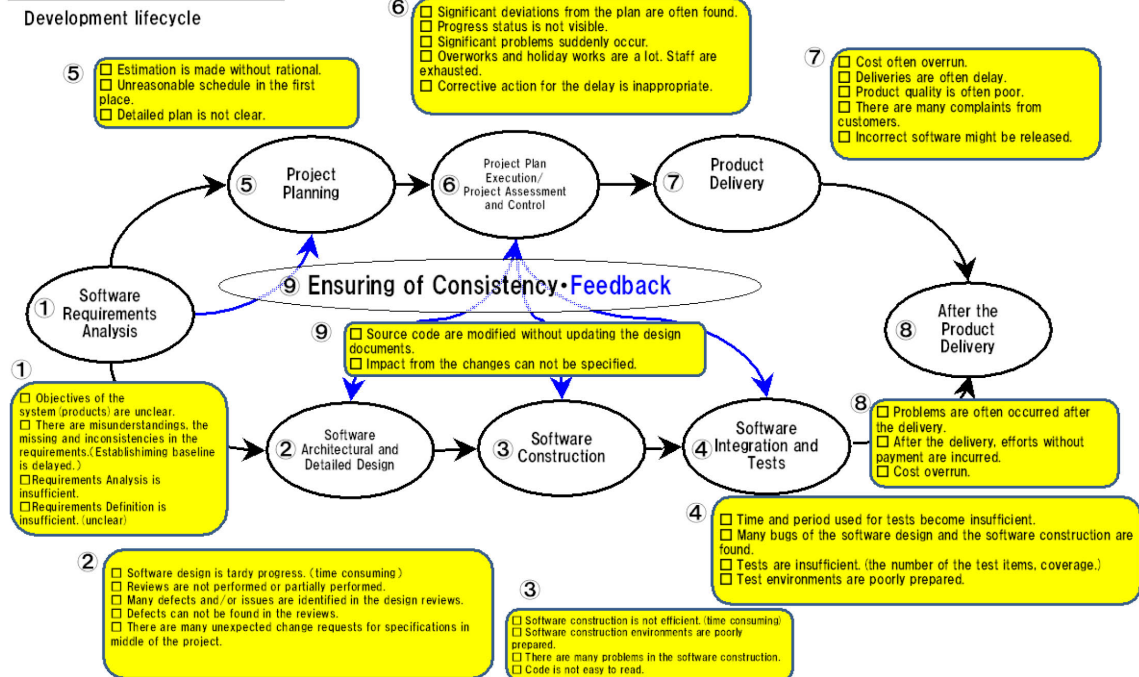
Firstly, use Problem Awareness Sheet to roughly check problems occurring in the field.

In the above chart, the ovals and the arrows show a general workflow and information flow. Note that this chart is not intended to show Waterfall model.

Around the ovals, there are examples of problems which are common in software development.

Although these are abstract, tick the boxes if your situation is similar. They do not have to strictly match, though.

If there is any other problem, make a note using post-it.

STEP2: Explore problems more closely and analyze causal relations

■Significant problems suddenly occur.

■Project suffer a lot of specification changes.

■Detailed plan is not clear.

■Overworks and holiday works are a lot. Staff are exhausted.

■Times and period used for test is insufficient.

■Requirements definition is insufficient.

■Requirements are unclear.

■Defects can not be found in the reviews.

■Reviews are not performed or partially performed.

■Significant deviations from the plan are often found.

■Costs often overrun.

■Products quality is often poor.

■There are many complaints from customers.

■Many bugs of the software design and the software constructions are found

Explore the extracted problems

Analyze causal relations.

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Write down each problem you ticked in STEP 1 on a Problem Card, and add specific facts in your situation. These will be helpful when analyzing later.

Arrange the cards and post-it on blank Study Worksheet and connect them with arrows to indicate rough causal relationships.

More specifically; pick up any two cards (A , B) arbitrarily, and if there is some kind of relationship, for example, solving A leads to B's improvement (mitigation/lapse) then, draw an arrow from A to B.

・Repeat this action until the whole relationships are pictured.

※Note that the arrows used here show only causal relationships and not the order of information flow.

By taking this action, it is expected to understand the structure of problems based on the facts.

Adding facts and rearranging the cards through reviews and analysis will ultimately reveal actual situation. In the nutshell, it is important to understand your current situation (as-is) realistically. It could be called "Trouble model". Completed "trouble model" shows the consequences on the right and mechanism of problem occurrence on the left.

STEP3: Focus the area of improvement

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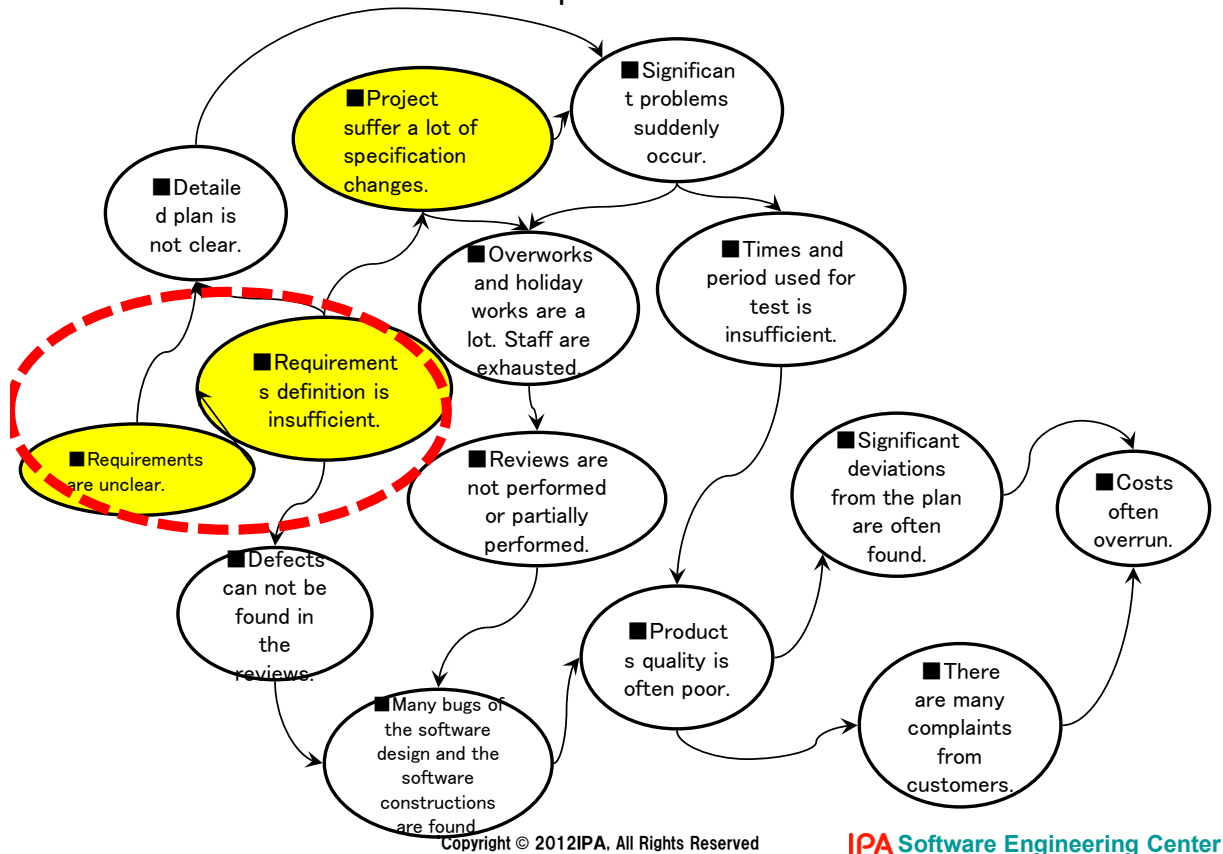
In STEP3, using the "trouble model" completed in STEP 2, imagine your ideal situation (to be), for example "obtain customer satisfaction"," reduce defects", etc. and select the significant problems which are obstacle to realizing your ideal situation.

This work should be addressed with the following points;

・The objective of this step is to narrow down the number and area of the problems to be focused to a realistic and controllable size. It is also necessary to consider cost-effectiveness.

・If the root causes of the problems have been found out, try to concentrate your improvement efforts on them considering the already mentioned objectives.

・When it comes to root causes, problems originated from upstream phases of software development are often considered, but that is not always the case. If there are significant problems included in the context and if those problems could be solved, then those should also be focused. The approach of "This time, pick up this problem." is also useful.

・When selecting the problems, try to find areas where improvement will be likely to bear expected fruit rather than identify the root causes. It is ideal that any area, where improvement is not achieved by yourself but need helps of other companies or other people, should not be included in the scope. (Having said that however, if improvement of such area is highly attainable, it may be included).

・In addition, consider the cost -effectiveness and schedule of the improvement of the focused areas so that the improvement could be more realistic.

・The focused problems can be changed in later steps.

STEP4: Select relevant Study worksheet

■Development lifecycle

1.Software Requirements Analysis

a) Objectives of the system (products) are unclear.	WS-P31-1 Elicit the customer's needs.
	WS-P32-1 Transform the customer's requirements to the system requirements.
b) There are misunderstandings, the missing and inconsistencies in the requirements. (Establishing baseline is delayed.)	WS-P31-1 Elicit the customer's needs.
	WS-S1-1 Clarify the standards documents and the content which should be developed written in them.
c)Requirements Analysis is insufficient.	WS-JRev-1Review the work products developed in the project with the stakeholders.
	WS-S5-2 Perform validation（Confirm whether what the customer actually wants can be implemented.)
d) Requirements definition is insufficient. (unclear)	WS-P32-1 Transform the customer's requirements to the system requirements.
	WS-P31-1 Elicit the customer's needs.
	WS-TM-1 Ensure the consistency from the customer requirements to the work product and the deliverables which are developed in the project.
	WS-S1-1 Clarify the standards documents and the content which should be developed written in them.
	WS-S5-1 Develop the organizational policy and the criteria of the validation.
	WS-S5-2 Perform validation（Confirm whether what the customer actually wants can be implemented.)

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Select relevant Study Worksheet that fits the improvable problems focused in STEP 3. The above table is an excerpt of Theme Mapping Lists. Refer to Theme Mapping Lists and choose appropriate Study Worksheet for each problem.

When selecting, do not just watch the "①theme" but look at "② When this theme has been solved, what will be improved?" on the Study Worksheet.

STEP5: Fill in Study worksheet

Fill in relevant Study Worksheet so that you could find solutions by yourself.

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Study Worksheet is used for consideration of a specific improvement solution of your software development for each theme you selected. The time scale of the improvement activities can be short or long, but in either case, it is important to actually tackle with improvement activities in accordance with what you write down here. This is not a school test, so theoretical answers are not necessarily needed. The front side is for you to fill in and the flip side is examples to support your work.

Front side

Study Worksheet

1. Themes and issues	5. How do you want to address this problem?
①Selected theme	※ Think to refer the solution examples on the flip side.
②When this theme has been solved, what will be improved?	
2. How do you handle this issue currently?	**Improvement Solutions**
Current "way of work"	
3. Good and bad points of the current "way of work".	6. Constraints to address the above.
※ Describe where good and bad points of the current "way of work".	※When the action plan is performed, the restrictions, costs and impacts to the others etc.
Good and bad points of current "way of work"	**Constraints**
4. Where are the insufficient points and the points that should be improved in the current "way of work"	7. Reminders to address the above.
※ It is good to relate with the improvements which are considered in the analysis and focus for problem.	※Necessary collaborators and requests of supports related parties etc.
Improvements	**Reminders**

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Fill in Study Worksheet in accordance with the guideline below.

1. Theme and issue: Each selected theme on the software process
"When this theme has been solved, what will be improved?" explains the theme and issue more closely. Confirm if these are described what will be improved.

2. How do you handle this issue currently? : Describe how this theme is handled in the field honestly. Whatever it is, it must be related to a certain product or service and think positively when to describe.

3. Good and bad points of the current "way of work": Write down both good and bad points of the current way of work as many as possible. It is important to think that good points can be better and bad points can be improved.

4. Which are the insufficient points and the points that should be improved in the current way of work: Describe what you want to improve regarding the current way of work, what customers and managers want you to improve, and so on. Just listing up improvement opportunities is fine.

5. How do you want to address this problem? : Describe what you are to make improvement and propose improvement opportunities considered at previous step. You can refer to the flip side, but the description there is only an "example," it may be irrelevant to your case. You should describe in your own words based on your situation. Do not copy. What described here is the actual solution for the improvement.

6. Constraints: When implementing the improvement solution made in #5, specify the possible constraints about cost, organizational structure, human resources and so on.

7. Reminders: To implement the improvement solution made in #5 and to deal with the constraints specified in #6, describe requests for relevant stakeholders (such as colleagues, team leaders, superiors, customers, etc.) as needed.

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Flip side

Study Worksheet

(WS-S2-1)

1. Themes and issues	5. Solution 1
①Selected theme There are strategy and structure of configuration management. ②When this theme has been solved, what will be improved? ・By establishing strategy and structure of configuration management, rulemaking and operation can be carried out for the "version control", "baseline control" and "change management" . ・Manage of baseline for the configuration element which created in the project lifecycle, the release can be succeeded without degrading and confusing the files. ・Management can be performed appropriately what kind of function in incorporated in release version.	・To perform the configuration management, activities such as the plan for creation of baseline management, the version of work products including specific baseline, the creation of tractability metrics to ensure consistency and the naming rules to identify the baseline etc. ・Configuration management is different the definitions depend on the organization and the project. Therefore, the own method of configuration management should be informed by the training, OJT and orientation in the organization and the project. ・In some cases, configuration management is defined such as the reposition of backup data, the date of program source, the version, the records of the comments for the each version, the registering files(check-in), the retrieving files(check-out), the view of difference data and the control of software configuration changes.
2. Possible problems when this theme is not handled.	6. Solution 2
・The consistency for configuration element of product and the tractability can not be maintained. ・When the specification changes and maintenance are performed, the procedure such as analysing the content of document, determining the necessary change items and changing relevant programs can not be followed. ・Incidents and troubles are happened such as degrading a [...] development, and inefficient works, inaccurate information [...] occurred.	If tools are not adopted, there is also the way of alternating the function such as check-out and check-in by the folder management. For example, the program which is created by person in charge won't be submitted to the project module and the incidents of degrading and confusing the files can be [...] for share folder in the project by performing "write- [...] ager and project manager.
3. Necessary implementations to address this theme.(typical activities)	7. Recommended Study worksheets to refer to on addressing this theme
・Establish the strategies of the configuration management activities including policy, task list, work products, responsibilities and timing of the periodical audit for the configuration management. ・Clarify the work products which are subjects of configuration management, such as specifications and source code, etc . ・Establish the structure to manage multiple control levels such as goals and risks of the project. ・Conduct the audit of configuration management periodically to maintain the consistency of configuration baseline.	・WS-S2-2 Work products (interim product and deliverables) and their development period in the project are determined. ・WS-S2-3 Change management of the work product (interim product and deliverables) of the project is performed. ・WS-S2-4 There are mechanism to ensure consistency for the work products (interim product and deliverables) which should be developed in the project.
4. Difficulties to achieve in reality	8. References(The processes of SPEAK-IPA and other materials.)
・Only source code is updated by the specification changes etc., and the related product which is needed to ensure the consistencies such as the design document and the test specification may not be updated. ・In large-scale projects, due to the function additions specification changes increase, and so do configuration elements of the product..Therefore, the changes are not managed such as managing many generations of modules, returning to one generation and linking again. Version of product and change history can not be obtained. ・Configuration management should be managed across the requirement definition document, the design document, the program and the test specification. But in fact, the complicated works are cut out the needs of updating the related document and also performing baseline management of configuration requirement. It is all managing the version control of program module.	・Author: Edward Yourdon Title: Decline and fall of the American programmer ・Author: Frederick.P.Brooks Title: The Mythical Man-Month :essays on software engineering ・Writer: Hidekazu Higashi (data process) Website (Japanese) : Configuration management are performed to files easily and positively by Sub-version @It Self strategy laboratory Http://jibun.atmarkit.co.jp/lskill01/rensai/tool10/04/01.html

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Example by themes

The flip side of Study Worksheet describes cases by themes. You should consider by yourself according to the form. The flip side is just example to support your work. The flip side includes the following contents. z

1. Themes and issues

This item shows the subject and issues for improvement and the current problem occurring in the field.

2. Possible problems when this theme is not handled.

This item shows possible problems when this theme is not handled and they are related to the problems occurring in the field.

3. Necessary implementations to address this theme.(typical activities)

This item shows typical activities to address this theme. But they must be interpreted depending on the reality in your field, and all of them are not always appropriate for the field. So, interpret them and select the appropriate items.

4. Difficulties to achieve in reality.

This item shows some difficulties when the typical activities are implemented. Analyze them with what is happening in your field to consider activities which are effective for you.

5. Solution 1

This item shows an example for actual solution to implement a typical activity along with the theme.

This is only an example and may not apply to your situation. Think of this just as a reference.

6. Solution 2

Alternative solutions are shown.

7. Recommended Study Worksheets to refer to on addressing this theme.

This item shows the other related Study Worksheets which are recommended to refer to.
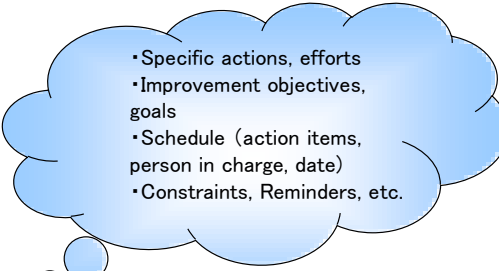
8. References (The processes of SPEAK-IPA and other materials.)

This item lists up the useful references to understand this theme more deeply.

STEP6: Get a better grasp through discussions with team members and specialists

Develop a detailed implementation plan based on Study worksheet.

Although the improvement activities could be started after STEP 5, it is more effective to discuss with the relevant teams, specialists or upper manager in your organization so that the activities could be shared with other teams or brought up as organizational activities. To do this, be aware of the followings.

・Specific improvement objectives and outcomes at the end of the activities should be identified.
・Note that the approaches for improvement are different depending on the context. For example, the field level improvement and the organizational level improvement are different in terms of people involvement or constraints.
・When the improvement activities are implemented in organizational level, create an occasion to share recognition with senior manager and address as organizational activities.

You could write down the action plan on the right part of Study Worksheet（5, 6 and 7), but for making the activities ensured, it is better to write the plan separately. To write it, consider the followings.

＊How to approach specific solutions
＊Improvement objectives and outcomes
＊Schedule（action items, person in charge, time schedule）
＊Constraints, reminders, etc.

To develop the action plan, consider the followings.

・The working period should be from three to six months. If it has to be longer than that, split the activities into several steps.
・Do not incorporate too much in the plan, otherwise the plan might fall through.

If the plan is developed by improvement team members in the organization, it is recommended that the plan lead to the organizational improvement activity. If it is developed by a project leader, consider that the plan could be useful in the next project. Do not forget to add individual names of practitioners in the plan. If it is developed by a senior manager, make sure the plan has a positive ripple effect on other projects.

STEP7：Apply results of study for improvement

Clarify the current work style, apply the "results of study" for improvement, and create a new work style.

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In STEP7, Examine current project (way of work) from the viewpoints considered in STEP5. If the consideration that the improvement is deployed within the team or across the organization is made in STEP6, take them into account, too. The points of examination are as follows.

　・work procedures, schedule

　・Resource allocation (staff, tools), approval

　・The kinds and/or the forms of work products

Then, create a new "way of work" specifically based on consideration of STEP5 and STEP6. To reorganize them, consider the followings.

　・See the current "way of work" and study carefully where and how to change.

　・Share recognition of a new "way of work" with relevant stakeholders.

　・If the improvement causes fluctuation on the field work or incurs new risks, share the information among relevant stakeholders.
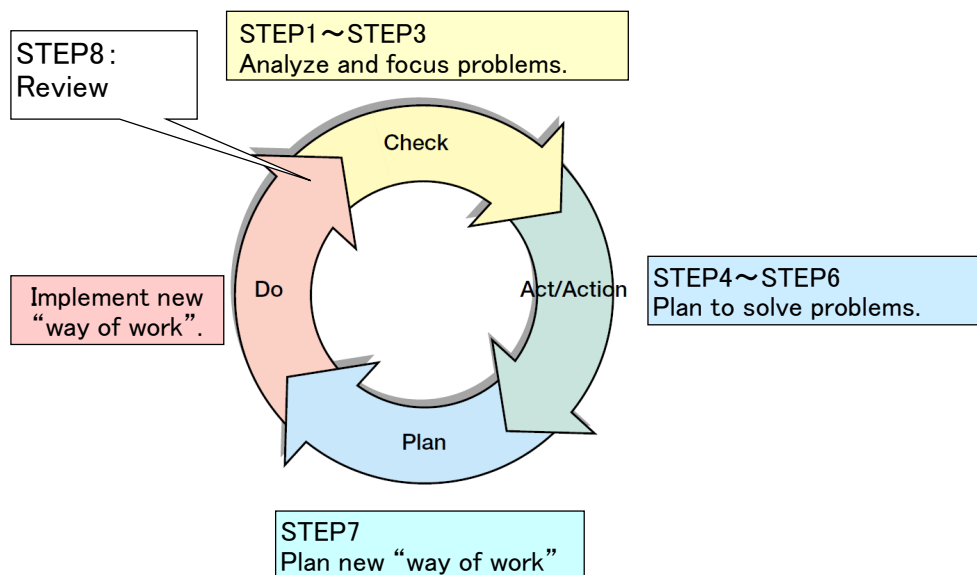
Perhaps, introducing new tools or document forms may worth considering.

When deploying the action plan to the field, check the followings.

　・Inform a new "way of work" to the people involved and get ready for transformation.

　・Decide the transformation schedule and make a shift to new "way of work".

　・Follow up after transformation. If there are any unreasonableness or contradiction, modify accordingly and notify the people involved.

STEP8: Conduct review

Review the improvement activities to find good/bad points about them. Then, recheck the results through Step1-7 and ensure that the operation has been improved.

STEP8:
Review

STEP1～STEP3
Analyze and focus problems.

Check

Act/Action

STEP4～STEP6
Plan to solve problems.

Do

Implement new
"way of work".

Plan

STEP7
Plan new "way of work"

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In STEP8, start from recognition of the result of improvement activities. Collect the results data of the improvement activities and confirm achievements of their objectives and outcomes defined in STEP6, summarizing in tables or charts. Before data collecting, it is more efficient to define the items to be collected in advance and to establish a collecting mechanism for them during activities.

Then, analyze how the problems have been solved based on the collected results. For reviewing, check the following points.

・If the focused problems have been solved or not. If the consequent problems related to the focus problems have been solved or not.

・If the focused problems have not been solved, check the "improvement action plans" written on Study Worksheet in STEP5.

・If the consequent problems related to the focused problems have not been solved, check your cause and effect analysis in STEP2.

These should be reviewed with the people involved to share the results.