

COTS Adaptation Method – A Lifecycle Perspective

Waldemar Britts

Accenture Digital
Stockholm, Sweden
waldemar.britts@accenture.com

Mira Kajko-Mattsson

School of Information and Communication Technology
KTH Royal Institute of Technology
Stockholm, Sweden
mekm2@kth.se

Abstract— More and more organizations customize Commercial-Off-The-Shelf (COTS) standard systems instead of developing the bespoke ones. Despite this, there are still few methods that support adaptations of COTS standard systems. The ones that exist are either outdated or they only focus on some specific steps. None of the currently defined methods cover standard system adaptation from the lifecycle perspective and none of them provide concrete guidance for how to adapt COTS systems to the customers' needs. As a result, many organizations have to develop their own adaptation methods in a trial and error manner. This paper suggests COTS Adaptation Method (COTSAM) including steps and guidelines providing advice for how to develop and evolve COTS-based systems during their lifecycle. The method has been explored and evaluated within one company that has used COTS for supporting the company's business processes for more than a decade.

Keywords— standard systems; reuse; lifecycle; business process.

I. INTRODUCTION

Standard systems have become very popular in the software industry. More and more organizations go over from developing bespoke systems to re-using complete standard systems instead [2][11]. This is because standard systems are considered to be more cost and resource effective than the bespoke ones. They have been reused many times in many different contexts by many different customer groups. For this reason, they are regarded to be of higher quality, reliability and maintainability. [7] [9]

Standard systems cannot always be used in their original form. Since they are created for a larger client base, they are very complex in their structure and can include elements that are not always needed by some clients. Therefore, they must be adapted to specific customers and their businesses. Some of their components must be removed, some may be retained in their current form and some other need undergo various types of adaptations. [3]

Adaption work can be very complex [1]. It does not only require knowledge of the standard system and of the customer's business but also knowledge of how to adapt standard systems to the needs of particular customers [7]. Methods supporting adaptation work are often called COTS (Commercial-Off-The-Shelf) adaptation methods or simply standard adaptation or customization methods.

COTS adaptation methods are extremely important for succeeding with the creation of standard-based software systems [10]. Lack of them may cost companies many

failures in form of malfunctioning software, missed deliveries, failed projects, or at its worst, failed businesses. Despite this, there are still very few methods that support adaptations of COTS systems. The ones that exist are either too general, or they focus on a limited part of COTS adaptation process, often dealing only with COTS selection step. Most of them are also old. Their average age is more than ten years [4][6][12][13]. To the knowledge of the authors of this paper, no published standard adaptation method focuses on the lifecycle of the standard-based systems.

To succeed with the adaptation efforts, many organizations are forced to use their own adaptation methods, which they have developed in a trial and error manner. Kliento is one of such organizations. They have customized one standard system for building their software applications for supporting their business operation. They used commercial-off-the-shelf (COTS) component package, which they then adapted to their own needs by mainly reconfiguring its components, writing glue code, by making various settings and by writing new own components. In the absence of such a method, Kliento was forced to develop their own COTS adaptation method. It has taken them more than one decade to develop it and it has cost Kliento both time and money in form of initial project problems and obstacles. Recently, the method has been successfully applied within ten sub-projects. Still however, it has not been formalized and documented within the company.

This paper suggests a COTS Adaptation Method (COTSAM) including steps and guidelines providing advice for how to manage COTS-based systems during their lifecycle. The method has been explored and evaluated within Kliento that has used COTS for more than a decade. So far, no research proposal has covered a complete adaptation method that manages the entire software lifecycle. Therefore, we regard COTSAM a unique and innovative method suggestion.

Our work was commissioned by Kliento. It included exploring the structure of their adaptation method, identifying problems with the method and providing suggestions for improving it. The company's name, Kliento, is a fictitious name. The company wishes to remain anonymous. We are not allowed to mention any information that can be used for identifying the company, project, or even the standard system used. The only thing we are allowed to reveal is that the application managed information about the organization's business and its very complex equipment.

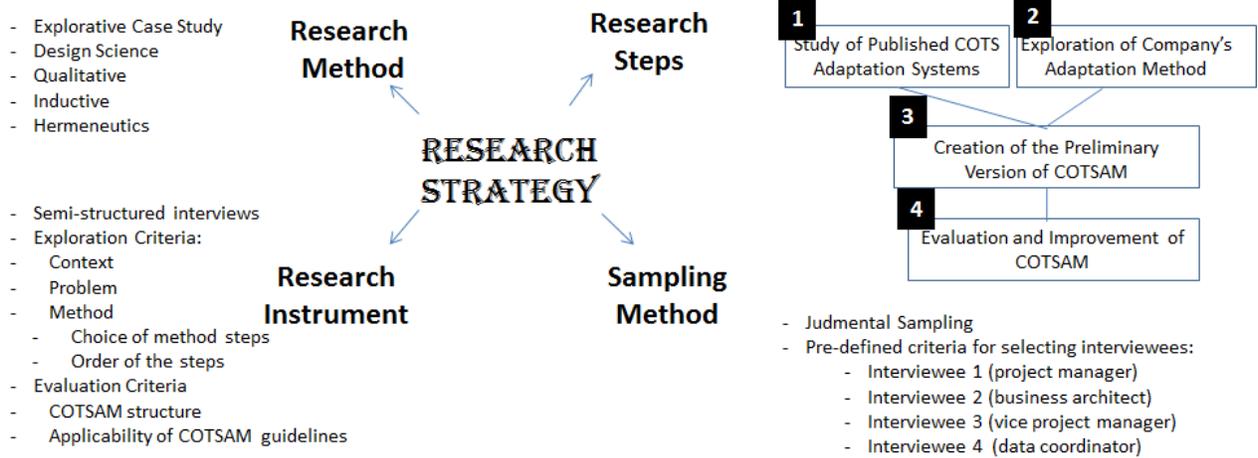


Figure 1. Our research strategy

The remainder of this paper is as follows. Section II describes the research method taken in this study and the criteria for exploring and evaluating the adaptation method. Section III presents the explored method at the company studied whereas Section IV describes COTSAM method. Finally, Sections V and VI evaluate COTSAM and make suggestions for future work.

II. RESEARCH METHOD

This study focused on an area that was relatively unexplored. The literature proved to be very limited and there were few methods dealing with the lifecycle perspective of COTS-based systems. Apart from literature limitations, it turned out that the method was not well established within Kliento. In Swedish parlance, the method sat in the walls, everybody knew it, however, understood it from his/her individual perspectives. The method was simply not well established within the company studied.

The status within Kliento has strongly impacted the design of our research strategy. As shown in Fig. 1, we conducted explorative case study to extract the design of standard adaptation method and elicit experiences related to the adaptation effort. The research was of a design science paradigm where the theory was extracted using the hermeneutic method [8].

A. Research Phases

Our study was divided into four research steps. As shown on the top right handside of Fig. 1, these were (1) *Study of Published COTS Adaptation Systems*, (2) *Exploration of Company's Adaptation Method*, (3) *Creation of the Preliminary Version of COTSAM*, and (4) *Evaluation and Improvement of COTSAM*. The first two steps were conducted in parallel. Here, we studied publications about standard adaptation methods and problems related to them. To our surprise, there were very few publications dealing with the subject. Although we found thousands of articles in various scientific databases, only five publications were of interest. Their focus was however restricted to only selection of standard systems.

In the next parallel step, we first studied Kliento's organization, products, adaptation method and problems related to the method. The step was conducted in form of explorative interviews with four different interviewees. Here we made four interviews with four different interviewees possessing the roles of project manager, business architect, vice project manager and data coordinator. We used Questionnaire 1 to be discussed in Section II.B. Explorative interview with Interviewee 1 was made for the purpose of understanding the company and its contexts. The explorative interviews with Interviewees 2-4 were made for the purpose of exploring the standard adaptation method.

In the third step, we created a preliminary version of COTSAM. Here, we studied all the interview answers using a hermeneutic method [5]. The interview results were interpreted in the context of the organization studied and its background and compared to published scientific results as achieved in the first research phase. The COTSAM preliminary version was then evaluated during our fourth step. Here, we had an evaluative interview together with Interviewee 4. We used Questionnaire 2 to be discussed in Section II.B. The purpose was to determine the soundness and applicability of COTSAM method within Kliento.

B. Research Instruments

The research instruments used in this study were two interview questionnaires based on explorative and evaluative research criteria. Using the explorative interviews, we examined Kliento's organization, its structure, adaptation method and its problems and consequences. Using the evaluative interviews, we established the soundness and applicability of COTSAM at Kliento.

Explorative interviews were conducted using the explorative questionnaire. Its purpose was to get acquainted with the activities within the organization, its standard adaptation method and problems. Questionnaire 1 was based on the following explorative criteria:

- **Context** standing for the development context in which Kliento's standard adaptation method was used. This

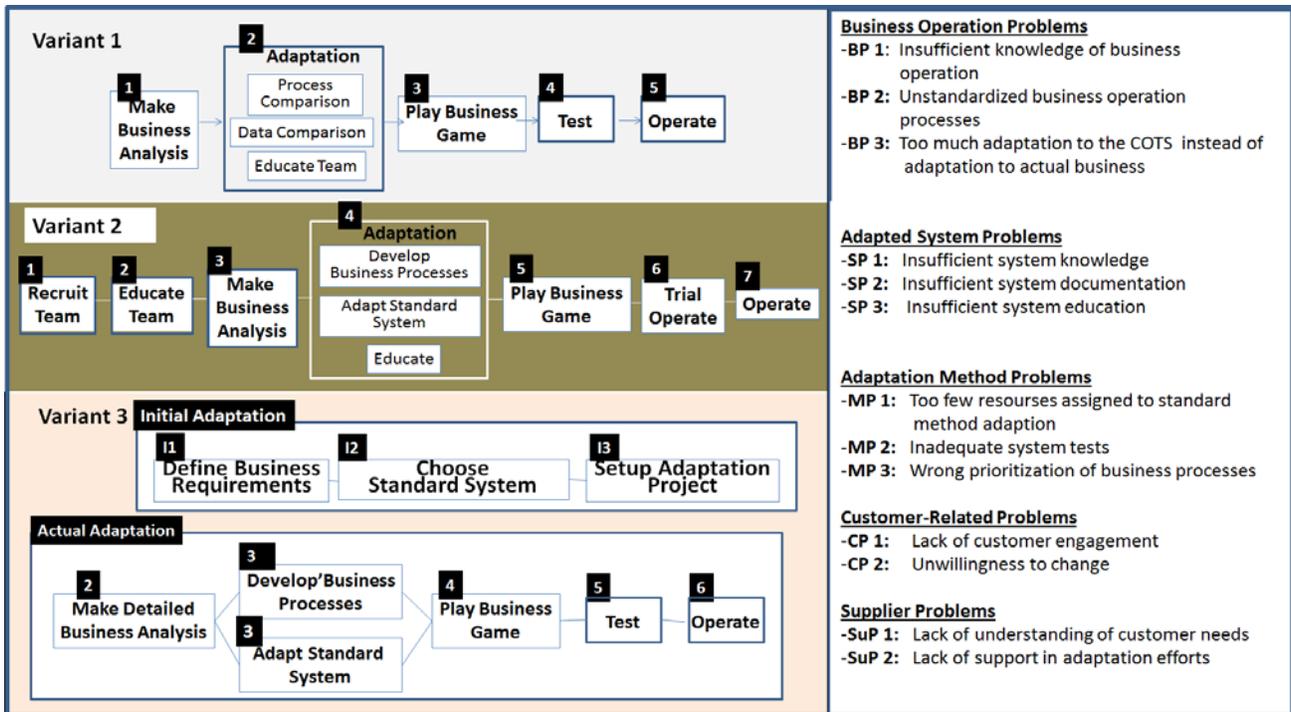


Figure 2. Variants of standard system adaptation methods and problems as explored at Kliento

criterion was used for acquiring basic knowledge of Kliento and for understanding its main activities.

- **Method** standing for a set of activities, rules and criteria aiding in adapting standard systems to a functioning information system.
- **Problems** standing for difficulties and consequences that Kliento has experienced within standard adaptation work. Identification of problems is an important prerequisite for drawing lessons learned, for relating them to lack of or insufficient process steps, and for designing method solutions that may avoid them.
- **Method ownership** standing for the role possessing end-to-end responsibility for developing, establishing and improving the standard adaptation method and for assuring its quality across the whole organization. The role's ultimate responsibility is to ensure that the method is consistent throughout the whole organization and that it is understood in a uniform manner.

Questionnaire 2 was of evaluative nature focusing on evaluating the applicability and soundness of the preliminary version of COTSAM. It was designed according to the following evaluation criteria:

- **COTSAM structure** evaluating the choice of standard method steps and the order among them.
- **Applicability of COTSAM guidelines** finding out whether the guidelines were realistic, whether they were robust in preventing the problems as identified at Kliento and whether they were applicable at Kliento.

C. Sampling

The choice of the interviewees was not done through randomization but through *judgmental sampling* [5][11]. The

interviewees were chosen according to their ability to contribute to our research results. They had to fulfill the three following criteria: (1) they should have extensive experience of the company studied, (2) they should have experience in adaptation work, and (3) they should both represent user and development sites.

III. EXPLORATION RESULTS

The exploration step (Step 2 in Fig. 1) has resulted in three different method variants. This implies that three different interviewees has three different opinions of the standard adaptation method. The variants are all presented in Fig. 2 and briefly describe below. To facilitate the follow up of Fig. 2, we mark each activity with a numeric identifier both in the figure and the text describing it.

Variant I has been explored by interviewing *Interviewee 2*. In its first step (1), Kliento makes business analysis and analyzes a specific business operation by studying its documentation and by identifying its needs. The step results in a summary of the business operation and a list of requirements for the improvements of business operation under consideration. This provides input to the next step (2), during which the standard system gets adapted according to the business requirements. Here, one compares the current business process and the data used by the process to the business requirements. In parallel, one educates in the new improved business operation. In Step 3, Kliento performs a serious business game focusing on making initial tests of the adapted system. During the game, Kliento reviews the overall business workflow and makes sure that it works as

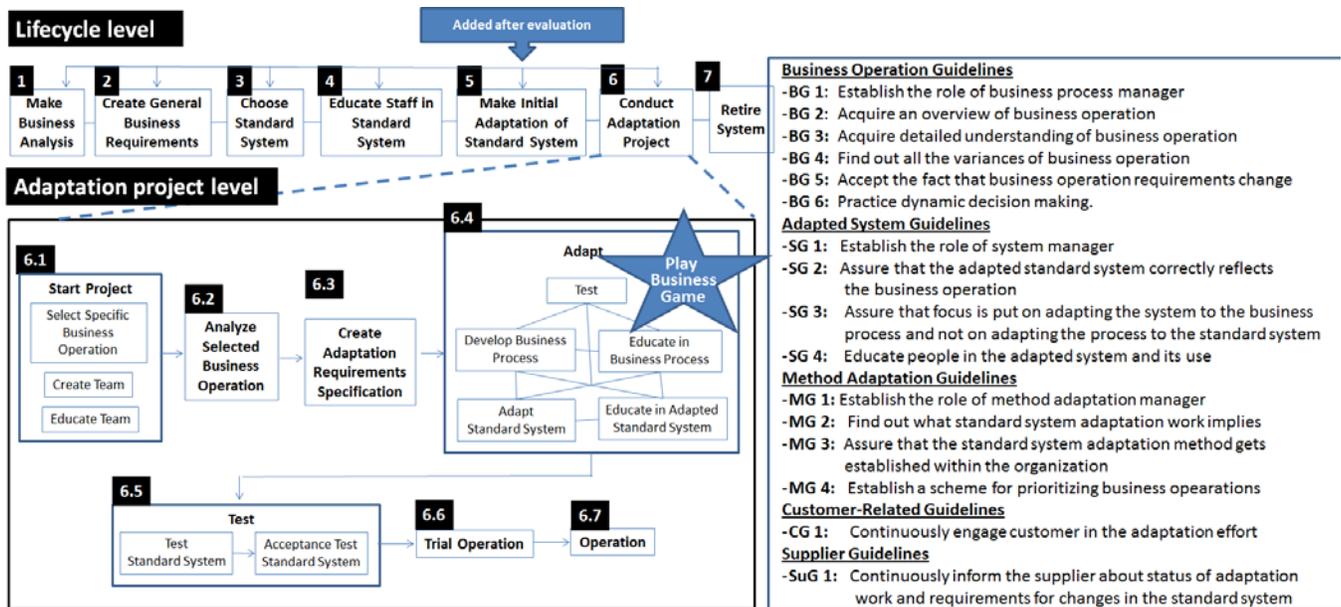


Figure 3. COTSAM steps and guidelines

requested. Finally, Kliento conducts system and acceptance tests (4) before deploying the system for operation (5).

Variant II has been explored by interviewing Interviewee 3. As shown in the middle part of Fig. 5.3, the adaptation process starts with recruiting a team (1). The step ensures that Kliento has enough staff with the right skills who can conduct the work. The team is then educated and trained (2). Afterwards, the team members conduct business analysis with the aim of laying out the status of the part of business under consideration (3). This provides input to Step 4, that is, input for developing business processes, adapting the standard system to the newly defined business processes and for educating the end users in the new business process and the system supporting the process. The three parallel adaptation steps converge in the business game step (5) testing the changes made. Finally, Kliento deploys the system in two consecutive steps: for trial operation (6) and for final operation (7).

Variant 3 has been explored with Interviewee 4. The process consists of two stages: *initial adaptation* and *actual adaptation*. The initial adaptation includes activities required for starting the adaptation project. These imply definition of business requirements (I1), choice of a standard system (I2) and setup of the adaptation project (I3). As soon as those activities are finalized, the actual adaptation of the standard system starts.

The actual adaptation is realized in a number of sub-projects, each dedicated to a particular business operation. Here, Kliento makes a detailed analysis of the business process under study (2), develops or improves the business process (3) and then adapts the standard system (3). The system process is then tested with the serious business game (4), to be then system and acceptance tested (5), and finally, to be deployed for operation (6).

Our reader does not need to be very astute to see the differences of the perceptions of the standard system adaptation method at Kliento. The reason is that the process was not standardized and established within the whole organizations. As shown on the righthand side of Fig. 2, this has led to many problems which we classify as follows:

- *Business operation problems* dealing with insufficient knowledge of business operation, lack of standard business operation process and too much focus on adapting the business process to the standard system instead of adapting the system to the process.
- *Adapted system problems* dealing with insufficient system knowledge due to problems, such as insufficient system education and system documentation.
- *Adaptation method problems* dealing with putting too few resources into the adaptation projects, inadequate tests and improper prioritization of business processes to be implemented.
- *Customer-related problems* implying lack of customer engagement and unwillingness to change the business processes.
- *Supplier problems* implying lack of understanding of customer needs when developing and evolving standard systems which is the result of supplier’s absence in assisting the client companies in their adaptation efforts.

IV. COTSAM

COTSAM is a method that has been explored within the adaptation projects at Kliento. It is been extended with issues elicited within the literature and evaluated through the interview with Interviewee 4. As shown in Fig. 6.1 COTSAM consists of two parts. These are *Method Steps* and *Guidelines*. The method steps list the main steps in the

adaptation work and guidelines provide guidance for how to optimally implement the steps.

A. COTSAM Method Steps

COTSAM method steps are presented on two levels (1) on the lifecycle level and (2) on the adaptation project level. The overall lifecycle steps range from making initial general business analysis, to defining business requirements, to choosing a standard system, starting adaptation projects, to finally, retiring the system. The steps on adaptation project level focus on selecting a particular business process and adapting the system to the requirements of the selected business process. Below, we describe the two levels in detail. To facilitate the follow up of Fig. 3, we mark each activity with a numeric identifier both in the figure and the text below.

On the lifecycle level, the following takes place. First a general business analysis is made (1) and general business requirements are specified (2). Here, one does not need to go into all the details of the business and requirements. What is important is to create an overview of the business operation on such a level of detail that it enables informed standard system selection (3).

After having selected the standard system and before starting the adaptation projects, key people must be educated in the standard system (4). Education is then followed by an initial adaptation of the standard system (5). Here, one makes general adjustments of the standard system to the overall business needs. This step is then followed by a series of adaptation projects (6). Adaptation projects are carried out iteratively where focus is put on a particular business operation. Finally, the system gets retired if it no longer is able to support business operation.

Each adaptation project includes a number of sub-steps (5). Projects start with the selection of a specific business operation (5.1), creation of the team dealing with the adaptation of the standard system to the business operation under consideration and education of its members. The team then analyzes the business operation (5.2) and creates adaptation requirements specification describing what parts of the standard system need to be adjusted to fit the business operation.

As a next step, the standard system gets adapted (5.4). The adaptation step is not simple. It consists of several steps and the order among the steps may vary from case to case. Overall, the steps are conducted almost simultaneously. While developing the business process, one adapts the standard system to the business needs and educates people both in the business process and the adapted standard system. All this provides feedback to testing. The newly defined business process is being tested at the same time as the standard system gets adapted and as the people are educated in business processes and in the adapted standard systems. The same applies to the adapted standard system. As soon as its fully or partially workable solution has been

implemented, it is tested by playing a serious business game simulating the newly defined business operation.

If the outcome of the business game is satisfying, the adapted standard system undergoes system and acceptance tests (6.5) to be then forwarded for trial operation (6.6). During the trial operation, the new system part is operated on together with the old system part. Only after one is certain that the new system correctly supports the business operation, it gets deployed for operation (6.7). The old system part gets retired.

Our reader may probably react that COTSAM presents and suggests the order among its activities. The order however is not compulsory. Users of COTSAM may conduct activities in any order that they feel comfortable with. However, some order is natural and if it is not followed, then the adaptation endeavor may encounter problems, and thereby, endanger the adaptation work. For example, you have to define the entire business first, at least on a coarse level, before setting up a system to support it.

B. COTSAM Guidelines

COTSAM guidelines provide guidance for how to optimally carry out the method steps and avoid problems that may be encountered within standard method adaptation efforts. COTSAM suggest six groups of guidelines. As listed on the righthand side of Fig. 3, these are (1) *Business Operation Guidelines*, (2) *System Guidelines* (3) *Method Adaptation Guidelines*, (4) *Customer-Related Guidelines* and (5) *Supplier Guidelines*. Their choice depends on the problems that have been encountered within Klento. Their purpose is to remedy these problems.

Business Operation Guidelines deal with business process understanding, ownership and decision making with regard to business processes. Guidelines **BG 2-4** deal with acquiring understanding of the business process on both general and detailed levels. Organizations should put enough resources into assuring that the business process is correctly understood. One should also have a good understanding of all the variants of business operation so that they get considered when adapting the standard system. All this constitutes a basis for defining the system support for the business process.

To assure uniform understanding of business operation, one should define a role responsible for it. For this reason, we suggest Guideline **BG 1**. Here, we suggest establish the role of business process manager who should define business operation and establish it within the organization. Lack of such a role implies a risk that the business process will be implemented in different ways by different individuals and that the adapted system supporting the process will not reflect it properly.

The last two business operation guidelines, **BG 5-6**, deal with decision making. Organizations should accept the fact that business processes change as late as during the adaptation process. While adjusting the standard system to the business process, one may acquire a better

understanding of the business process and its defects. This should not prevent organizations from changing their business processes even that late in the adaptation project work. To enable this, organizations should practice dynamic decision making allowing them to change or improve their decisions based on what is known now and based on the new expected or unexpected events that motivate decision changes.

Adapted System Guidelines focus on assuring that the system correctly reflects business operation (SG 2). For this, organizations should define the role of system manager (SG 1) who makes sure that while adapting the standard system, focus is put on assuring that the system gets adapted to the business process and not vice versa (SG3). Finally, system manager should make sure that people are educated in the adapted system and its use (SG 4).

Method Adaptation Guidelines focus on assuring that companies establish an organization-wide standard system adaptation method (MG 3). Companies should make sure that they have an appropriate prioritization scheme of business operations that should be chosen for implementation (MG 4). Before starting any adaptation project, they should find out what standard system adaptation work implies (MG 2). Is it better to use a standard system or is it better to develop a customized system? All this should be managed by a method adaptation manager (MG 1), the role ensuring that everyone in the organization is using the adaptation method in a uniform manner.

The last two guidelines deal with customers and suppliers. *Customer-Related Guideline* (CG 1) remedies the problem of lack of customer engagement in the adaptation work whereas the *Supplier Guideline* (SuG 1) aids in assuring that the supplier gets insight into the status of the adaptation work of their customers, and thereby, become better in adapting their standard systems to the needs of their customers.

V. DISCUSSION

The preliminary version of COTSAM was evaluated during the fourth interview using two evaluation criteria (1) *the structure of COTSAM* and (2) *the applicability of its guidelines*. Here, Interviewee 4 was presented the COTSAM draft, three variants of the adaptation method as perceived by our three interviewees and the COTSAM guidelines. Below, we briefly describe the evaluation results.

A. COTSAM Structure

Interviewee 4 was of the opinion that COTSAM was sound and out of the four variants (three initial variants plus the COTSAM draft), the COTSAM draft was the best reflection of the standard adaptation work at Kliento. Since Kliento did not have time to formalize and generalize their method, COTSAM would serve as a basis for improving the company's method.

According to Interviewee 4, the method was satisfactory and all its steps were relevant. The method was complete from a lifecycle perspective, and none of its steps were superfluous. However, after a closer analysis of the three method variants, Interviewee 4 pointed out that COTSAM missed a very important step, Step I3 in Variant 3 dealing with a setup of an adaptation project. According to him, this step constitutes a basis for all further adaptation projects and it should be clearly distinguished in the model. This step is important for achieving a stable foundation for continuing with the adaptation efforts. To remedy this, we extended COTSAM with Step 5 which we call *Initially adapt the standard system*.

The interviewee pointed out that even if the overall design of COTSAM looked simple, its steps were very complex. For example Step 3 dealing with standard selection is very complex, difficult and costly. Also Step 4 and the newly added Step 5 dealing with the education in the standard system and its initial adaptation are very heavy and extensive. Here, one must understand the system's processes, understand business processes, customize business processes and system processes, find out how the data from the system to be replaced can be transferred to the new customized system and how to build interfaces between the two systems. All this cannot be done on first attempt. A number of retakes is normally required before everything falls on place.

The contents of Step 5 almost corresponds to Step 6 (*Conduct Adaptation Project*). The difference lies in the fact that the initial project is the first adaptation project (5) in a series of adaptation projects (6). It should however be distinguished as a separate step due to the fact that its success is crucial for the next-coming projects. On purpose, the initial project should neither be too large nor too small. It should be of such a size so that the organization may begin to find its own feet in the adaptation work.

With the addition of Step 5, the interviewee was of the opinion that the choice and the order of COTSAM steps were relevant. The sequence of steps assured that the method could be conducted in a systematic and controlled manner. An incorrect sequence has already led to some large efficiency problems at Kliento. For instance, Kliento neglected Step 4 dealing with the education in the selected standard system. This created problems in Step 5. The initial adaptation project took extra long time. This is because the adaptation team had to learn the standard system while doing the actual adaptation work.

Although our interviewee agreed that the order was relevant and important, he pointed out that the performance of COTSAM steps could differ from case to case. For example, one could perform the first two steps (Step 1 and Step 2) in a number of iterations before one went over to Step 3.

Interviewee 4 was of the opinion that the order of the COTSAM steps constituted an excellent roadmap of what main steps are to be carried out and where they belong to in

the standard system adaptation lifecycle. There should be a general business analysis before creating a general specification which should be done before choosing a standard system. You should not choose a standard system first and do a business analysis and create specifications then. Nor should you create requirements before you have made a business analysis.

The order between the substeps in Step 6 dealing with the actual performance of the adaptation projects was found relevant as well. According to our interviewee, these activities could be performed either sequentially or in parallel. The grade of parallelism could vary from case to case and it often depended on the complexity of and understanding of the business process to be implemented. The simplest case was when business process users mastered the business process well. Here, the adaptation steps could be conducted sequentially implying that a complete solution got produced for a particular business operation which was then tested and deployed. Only minor training was required.

More complex cases take place when one defines a new business operation and implements it in the standard system. Here, each business process step gets implemented in an iterative manner. One develops business functionality for only the first step, tests it, educates in it while implementing and testing the next step and so forth. Next iterations may not always imply implementations of the next business operation steps. They may imply adjustments of the implemented business process steps before going over to the next step.

B. COTSAM Guidelines

The applicability of the COTSAM guidelines was evaluated against the problems as experienced by Kliento. Our interviewee agreed that the guidelines were appropriate and that most of them have already been implemented at Kliento. Only four guidelines have not yet been implemented. These are going to be discussed below.

Our interviewee was of the opinion that all the business guidelines were relevant. Kliento has implemented them all except for **BG 1** dealing with the definition of a business process manager role. Although Kliento was aware of its importance, they have not managed to fully implement it. They have defined the role of business process manager. This role however did not conduct his/her responsibilities in a satisfactory manner.

Regarding Business Guidelines 5 and 6 (**BG 5 and BG 6**), our interviewee found them especially important and crucial for the successful implementation of business processes. The guidelines suggest that companies should accept the fact that business operation requirements change, and therefore, companies should practice dynamic decision making. It took Kliento several years to understand that they could not practice the traditional decision-making pattern. This resulted in substantial project delays, enormous costs and other serious productivity problems.

Guidelines **BG2-4** are extremely important according to our interviewee. They deal with acquiring understanding of business operation on both coarse-grained and detailed levels and identifying all their variances. Without them, it is practically impossible to run standard system adaptations. Because of their negligence, Kliento has experienced most of the problems as listed in this paper.

Kliento has implemented all the system guidelines. Despite this, they had problems in understanding the system. The system was very complex and as our interview expressed it, it was too big for one person to grasp it. More people need to have the role of the system manager where each system manager is responsible for a specific part of the system.

Out of four method guidelines, Kliento has not implemented three of them. These are **MG1** suggesting the establishment of the role of the method adaptation manager, **MG 2** dealing with finding out what standard system adaptation work implies before starting adaptation projects and **MG 4** dealing with establishing a prioritization scheme for business operations. Kliento is now in the process of implementing them. All of them are important for succeeding with the adaptation projects and they should be implemented from the very beginning. For instance, by not finding out what standard adaptation method implied, Kliento failed in balancing the allocation of resources to the different adaptation method steps. The organization had a wrong understanding of what a standard adaptation meant with regard to time resource consumption in different process steps. Insufficient resources were allocated to planning and testing.

Last but not least, all the customer and supplier guidelines (**CG1** and **SuG1**) have been implemented, however, too late. Kliento has not been successful in continuously engaging the end user in the business process development. Neither have they been successful in communicating their needs to the standard system supplier. Unfortunately, it took several years for Kliento to realize that these guidelines were very crucial for the success of current and future adaptation efforts. Especially the supplier guideline (**SuG 1**) is crucial for the organization's survival. If the supplier lacks understanding of the needs of its clients, the clients may become supplier-less, and thereby, system-less in the future.

VI. FINAL REMARKS

Despite the fact that more and more organizations procure standard systems, there are still few methods that support their adaptation and implementation. The ones that are available are either out of date or they focus on only the initial adaptation stages. This paper suggests a method for customizing standard systems. The method is called COTSAM (COTS Adaptation Method) and it was developed at Kliento. The work was carried out in form of a qualitative and explorative study [8]. The study was based on five interviews. Overall, one interviewee was involved in

COTSAM STEPS	COTSAM	CBA Framework
1. Make Business Analysis	+	- (Implicit)
2. Create General Requirements Specification	+	+
3. Choose Standard System	+	+
4. Educate Staff in Standard System	+	-
5. Make Initial Adaptation of Standard System	+	-
6. Conduct Adaptation Project	+	P
6.1a. Select Specific Business Operation	+	- (Implicit)
6.1b. Create Team	+	-
6.1c. Educate Team	+	-
6.2. Analyze Selected Business Operation	+	- (Implicit)
6.3. Create Requirements Specification Selected Business Operation	+	- (Implicit)
6.4. Adapt	+	+ (General)
6.5. Test	+	+
6.6. Trial Operate	+	+
6.7. Operate	+	+
7. Retire System	+	-

Figure 4. Comparing COTSAM to CBA Framework

providing a context for our study, three interviewees were involved in the exploration of standard adaptation method as defined at Kliento. One of these three interviewees was also involved in the evaluation of COTSAM.

The exploration showed that Kliento’s employees had a slightly varying picture of the company’s adaptation method. Therefore, our work resulted in three variant method descriptions. The reason was the fact that Kliento’s method had not been defined and properly established within the company. The exploration also resulted in a list of problems that were the actual consequences of lack of a defined and established standard adaptation method.

The three variants and the explored problems constituted a good basis for defining COTSAM consisting of a number of steps and guidelines that will guide the implementation of the COTSAM steps. COTSAM method covers the entire lifecycle, and therefore, it may be considered to be unique and innovative in its design. It provides a new and original perspective on a standard adaptation method which has no counterpart in the existing methods today. The only method that was reasonably related to this study was the Framework for Value-based CBA process decisions suggested by [13].

To evaluate the innovative contribution of this study, we compare the COTSAM constituents to the constituents of

the Framework Value-based CBA decision process. As shown in Fig. 4, CBA framework does not take into account the important steps, such as training in the standard system, the initial adaptation of standard systems, creation of adaptation team, training team and training in the system. Finally, the main difference is that COTSAM covers the entire life cycle whereas CBA is not explicit about it.

VII. CONCLUSION

COTSAM is defined on a general level and has only been evaluated within one organization. Its structure and guidelines need be further evaluated in other organizations. COTSAM needs be further expanded with more detailed activities and more guidelines. Last but not least, it should be expanded with more roles and responsibilities. Hopefully, the results of this study will contribute to, and accelerate, development of adaptation methods for standard systems.

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