A Lightweight Technology Change Management Approach to Facilitating Reuse Adoption

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Abstract. *The growing interest of software reuse by software organizations makes adoption and evaluation of reuse an essential activity. Many organizations struggle in their attempts to select appropriate reuse practices (methods, techniques and tools support) in their processes. In this way, we propose a lightweight technology change management approach to facilitate the adoption of software reuse practices, according to the organization's software reuse capability.*

1. Introduction

Software development today faces several challenges. There is a critical need to reduce cost, effort, and time-to-market of software products, but, at the same time, complexity and size of products are rapidly increasing and customers are requesting more and more quality products tailored to their individual needs [Broy et al. 2001]. Our research thesis is that software development based on a framework for incremental reuse adoption in the development process improves the quality, team productivity and time-to-market of many software development organizations.

However, there are many problems regarding the adoption of a new process into an organization, such as the natural resistance to changes, lack of credibility in the new process, among others [Frakes and Isoda 1994, Almeida et al. 2007]. But they are not just restricted to reuse. This is why there are incremental models, such as CMMI [SEI/CMU 2008] and MPS.BR [SOFTEX 2007], which help in this migration process.

In this context, we propose a Lightweight Technology[1] Change Management Approach to Facilitating Reuse Adoption, using the RiSE Reference Model (RiSE-RM) [Garcia et al. 2007] to guide the software reuse practices introduction based on the organization's software reuse capability.

[1]According to Merriam-Webster dictionary, **Technology** is the practical application of knowledge especially in a particular area; or a manner of accomplishing a task especially using technical processes, methods, or knowledge. Available at http://www.merriam-webster.com/dictionary/technology

2. Background: The Technology Change Management

Generally speaking, a Technology Change Management (TCM) is the process of developing a planned approach to the replacement of a legacy technology by a new one in an organization [SEI/CMU 2008]. The structured approach comprises the procedures and management activities for planning and monitoring the transition from one organizational structure, or business process, to another when a new technology is introduced, and it is used for efficient and prompt handling of all changes.

Technology Change Management was born in 1996 when Litton PRC Inc. began a program designed to systematically manage the incorporation of effective technologies into the organizations [Rios et al. 2006]. Nowadays, TCM is a key part of many of the existing capability maturity models. In the *Software Engineering Institute's Capability Maturity Model Integration* (CMMI) model [SEI/CMU 2008], TCM is related to organization's quality and process performance objectives consecution and is part of the *Organizational Innovation & Deployment* (OID), which is a *Key Process Area* in *Level 5 - Optimizing* in the Staged view of the model, and a *Process Area* inside *Process Management* in the Continuous view. In *Electronic Industries Alliance's Systems Engineering Capability Model* (SECM) [IHS 2008], TCM exists in a *Focus Area* named *Manage Technology*.

The problems related to reuse adoption and TCM were organized in the context of the RiSE (*Reuse in Software Engineering*) project. When applied to RiSE framework [Almeida et al. 2004], the TCM guidelines for Software Reuse Adoption (RiSE-TCM) are a comprehensive set of guidance intended to advise organizations on how to carry out the technology change management when adopting the software reuse approach for software system development.

3. The RiSE-TCM Guidelines

RiSE-TCM Guidelines provide a comprehensive support to determine the business and technological drivers for software reuse in a given organization, to set measurable achievable business goals and to develop an action plan tracking these indicators to assess the progress and measure the achievement.

Before starting the changes, the organization's RiSE-RM maturity level has to be assessed providing guidance on a possible roadmap in accordance with the maturity level objectives [Garcia et al. 2007].

The RiSE-TCM action plan definition is based on organization's business objectives in accordance with the RiSE Adoption Process Framework (RiSE-APF) and the RiSE-RM. The RiSE-APF provides a structured collection of engineering and management practices for software reuse enriched with support material such as templates, references to tools and techniques, while the RiSE-RM establishes a roadmap for adoption of the software reuse practices. It can also be used for evaluating the level of institutionalization of software reuse in a given organization.

The activities in the RiSE-TCM action plan are based on the definition and the tracking of the business and engineering metrics provided in the Reuse Metrics Framework catalogue. The Reuse Business Metrics are a set of business metrics and indicators to assess the business success of software reuse approach adoption in an organization.

They provide managers with the objective information needed to measure the successful impact of software reuse adoption from a business perspective. The action plan provides also a set of metrics for monitoring the institutionalization.

The Reuse Engineering Metrics and measures are used on projects when software reuse is set up, are the drivers for monitoring the performance of software reuse processes and are, for some of them, used to calculate the Business metrics.

The relationship between these elements and their corresponding deliverables are depicted in the RiSE Adoption Process Framework conceptual model (Figure 1). In this model, we can see how the RiSE-APF elements relates to others external elements. In this Figure, shaded boxes identify RiSE related elements.

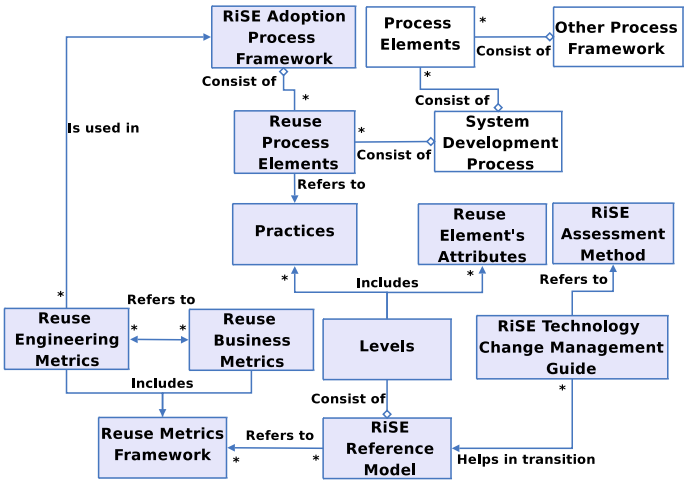

Figure 1. Conceptual model of the RiSE-APF

Basically, the framework is composed of four main modules: (i) the **RiSE Reference Model (RiSE-RM)** [Garcia et al. 2007], with the purpose of determining which process areas, goals and key practices should be considered, intended to advise organizations on how to carry out the technology change management when adopting the reuse approach, including a group of techniques, metrics, guidelines and tools; (ii) the **RiSE Assessment Method (RiSE-AM)** [Garcia et al. 2008] evaluates the organization's reuse capability and aids in planning the strategy to introduce reuse practices into the organization's process; (iii) the **RiSE Technology Change Management**, topic of this paper, responsible for supporting organizations in defining their system development processes by providing a structured set of guidelines, aiding the organization to ensure successful adoption of reuse through reuse business and technological drivers; and (iv) a **Reuse Metrics Framework**, responsible for defining a set of metrics to track the reuse adoption process and the return on reuse investment in a controlled way.

3.1. Common Principles for RiSE-TCM

The requirements, which determine the scope of the RiSE-TCM guidelines, are:

- The RiSE-TCM guidelines provide a comprehensive support to determine the business and technological drivers for software reuse in a given organization, to set measurable achievable business goals and to develop an action plan tracking these indicators to assess progress.

- The RiSE-TCM plan builds the business case for software reuse according to the organization's characteristics (i.e, size, maturity and better development practices), uses the RiSE-RM as a roadmap for software reuse deployment and identifies the path for a cost-effective adoption of software reuse practices.

- The RiSE-TCM guidelines provide a process to help an organization in the transition from another technology to software reuse technology.

- The RiSE-TCM guidelines explain an organization how to gain in maturity with software reuse technology.

This guide is based on the fact that software reuse benefits demonstrated through RiSE-RM and the RiSE-APF is sufficient for deployment.

4. The RiSE-TCM Process

The RiSE-TCM process uses the RiSE-RM and the results of the RiSE-AM to guide the reuse adoption and the transition of the maturity levels, according to the RiSE-RM levels. An organization can evolve in the maturity levels by making some changes in its structure or process, and adopting some features and benefits of the particular levels of reuse practice.

Figure 2 shows the main phases of the proposed RiSE-TCM Process and the life cycle of the plans.

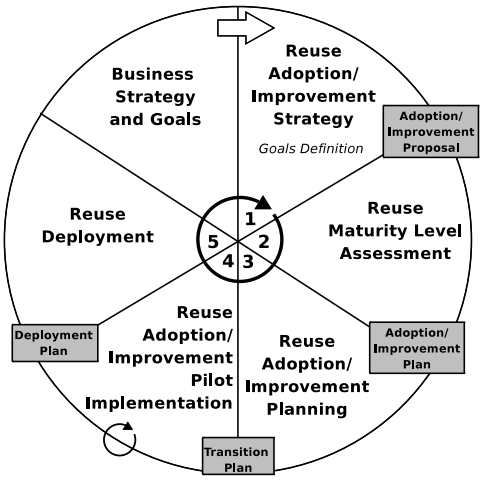

Figure 2. RiSE-TCM Process

The organization's mission, business strategy and goals drive the reuse adoption and improvement effort. The process intends to support those goals by means of using software reuse, and the methods, processes and tools related to it. The set-up practices associated to reuse in the first iteration will probably need to be improved or extended in further iterations for better achievement of the organization's objectives. This process and the time spent have to be tailored in accordance with the context of the organization's structure, its business goals, the maturity in managing improvement changes of the organization, and the reuse skills of the involved people.

4.1. First Phase: Adoption/Improvement Reuse Strategy - Goals Definition

The purpose of the first phase, in the RiSE-TCM process, is to identify the business goals of the organization for which software reuse may be helpful, and to build a Reuse Adoption/Improvement Strategy that addresses the attainment of those goals.

This phase is composed of four main steps:

Step 4.1.1 *Identify Business Goals and Drivers for Reuse Adoption/Improvement*. Identify the business goals and drivers for which reuse is foreseen helpful, can be used the RiSE-AM or another specific methodology, such as the *Balanced IT Scorecard* methodology [EIS 2008], as an aid.

Step 4.1.2 *Develop Reuse Adoption/Improvement Proposal*. Build the Reuse Adoption/Improvement proposal (RAIP) specifying: **(i)** which are the objectives and the approaches to address them; **(ii)** which are the Reuse Adoption/Improvement constraints, e.g. costs, duration and so on; and, **(iii)** identify the risks and the strategies the solve, or minimize them. This will be the basis for the adopt/do not adopt software reuse decision.

Step 4.1.3 *Ensure Sponsorship and Needed Resources*. Ensure all the needed resources for starting the RAIP are available: approval and funding, management support, motivation, human resources, other type of resources, among others.

Step 4.1.4 *Set up the Reuse Adoption/Improvement Proposal Infrastructure*. Build and set up the needed infrastructure to carry out the plan in the proposal: working groups, roles, responsibilities, etc.

4.2. Second Phase: Reuse Maturity Level Evaluation

The purpose of the Reuse Maturity Level Evaluation is to get an understanding of the organization's situation with respect to those business goals identified in the previous phase. This assessment is in terms of technical (i.e. processes, methods, tools, etc.) and non technical (i.e. organization structure, culture and educational problems, best practices, etc.) issues. The assessment is focused on:

- Estimating the depth of implementation of specific reuse practices.
- Checking that the established business and engineering objectives are understood by the staff and their monitoring is supported by appropriate measurement plan and engineering metrics.
- Checking that people have sufficient training in software reuse or get adequate on-the-job support, that the tools used are appropriate and that the measurement team is prepared for its job.
- Identifying continuous opportunities for improvement of the used reuse-related processes, methods and tools.

The assessment can be formal or performed internally following a lighter process, such as the RiSE-AM. In both cases, the use of a reference model to characterize the maturity degree of the organization's reuse capabilities is necessary. In the RiSE-TCM process the RiSE-RM is recommend to be used as a reference. This phase must be a continuous effort in order to promote the optimizing of the reuse practices in the organization.

The assessment results must be stored in a knowledge base in order to build a lessons learned repository about reuse capability in organization. The cases stored in this knowledge base should be consulted during a new assessment as a guide to aid the assessment team.

Whatever assessment process used, it is generally decomposed in three steps. Assessment team involves external actors from the RiSE-TCM responsible team as people from the targeted perimeter and process improvement people. The assessment team is composed of a lead assessor and assessors.

The three steps of this phase are:

Step 4.2.1 *Prepare the Assessment*. The purpose of this step is to gather arguments in favor of the reuse adoption program at the organization and to start the activities

to perform the assessment, plan the assessment, prepare the necessary documentation for the assessment realization and perform an initial assessment to allow to verify if the organization is ready for the RiSE-AM in the intended reuse maturity level.

Step 4.2.2 *Perform the Assessment*. The purpose of this step is to train the team for the accomplishment of the final assessment, to drive the final assessment, to communicate their results to the assessed organization and to evaluate the execution of the assessment method in the organization.

Step 4.2.3 *Document the Assessment Results*. The purpose of this step is to elaborate the Assessment Report, to gather the final assessment documentation and to send it to the designated auditor. After the approval of the documentation, the lead assessor sends to the sponsor the Assessment Report and communicates the result of the assessment.

The need of formal assessment (or assessment performed by external people) depends on the organization knowledge level in the domain of process improvement and appraisal, and also the availability of reuse expertise in the organization. It could be also linked to a need of official rating of the maturity level. The process used for the assessment could be based on RiSE-AM (as cited before). Moreover, the organization assessment team can choose another process, such as: ISO/IEC 15504-2:2003 [ISO/IEC 2003], SPICE project [Alec Dorling et al. 1997], SCAMPI [SEI 2001] or an internally defined process.

The assessment results are used internally by the organization. According to these results, the organization will choose which reuse practices should be implemented, linked with RiSE-RM maturity level: full implementation of the maturity level practices; partial implementation or cancel the reuse adoption.

4.3. Third Phase: Reuse Adoption/Improvement Planning

The Reuse Adoption/Improvement Planning phase is mainly for developing all the necessary plans to start a structured use of the software reuse technology in the organization. The software reuse technology will be introduced step by step in the organization. Therefore, use of the technology will be preceded by trials of possible reuse solutions applicable to selected system development areas. The selection of those areas will be driven by the reuse assessment results.

The different steps of the Reuse Adoption/Improvement Planning are:

Step 4.3.1 *Refine the Reuse strategy*. According to the results of the reuse assessment, the reuse strategy has to be refined to set measurable achievable business goals. Business goals are prioritized and indicators to be tracked during the selected adoption/improvement activities are designed.

Step 4.3.2 *Develop Adoption/Improvement Plan*. Develop the strategic Reuse Adoption/Improvement plan (long term), which report the Reuse Strategy and goals.

Step 4.3.3 *Develop the Transition Plan*. Develop the transition plan. *"Transition"* will be from the current status to a more improved status, that is, adoption action plan or improvement action plan. This action plan is the refinement of the RAIP, with finalized roles, activities and tactical plans for all the groups.

4.4. Fourth Phase: Implementation of the Reuse Adoption/Improvement Pilot

This phase consists mainly in implementing and monitoring several trials or pilot projects in which software reuse is used in those areas of the system development identified as improvement candidates in the previous phase. The trials will be carried out following the general planning (Reuse Transition Plan) made during the previous phase, but the specific plan for each of the trials will be developed herein.

This phase is composed by five steps, as follow:

Step 4.4.1 *Train the practitioners*. Form the technical groups that will carry out the specific adoption / improvement activities.

Step 4.4.2 *Develop or reuse solutions*. Develop several possible solutions for the improvement of a specific problem in the organization.

Step 4.4.3 *Pilot solutions: design and implement reuse trials*. Carry out pilot activities or trials for testing each proposed solution in at least one project. Monitor the progress and the results of the trials by means of selected metrics.

Step 4.4.4 *Select best solution*. Select the solution with better benefits, the one that maximizes the business goals with more priority.

Step 4.4.5 *Identify long-term needs*. Collect the identified long-term needs in terms of the needed resources and infrastructure for supporting the improvement for the long term (a few years).

4.5. Fifth Phase: Reuse Deployment

In order to continuously introduce the identified successful reuse solutions (methods, practices, tools, or combinations of these) into the daily activity of the whole organization, the RiSE-TCM team should start the Reuse Deployment.

The Reuse Adoption/Improvement solutions have been validated through pilots and the planned objectives of improvement have been demonstrated. The risks on the maturity of the tools used with the reuse maturity level to reach have been mitigated and the impacts on the current development process have been evaluated.

Moreover, the Reuse Adoption/Improvement solutions should be deployed, as appropriate, to new and ongoing projects. The management of the deployment has to be performed as a unique project.

The purposes of the Reuse Deployment's steps are:

Step 4.5.1 *Prepare the Reuse Deployment*: Develop the Reuse Deployment Plan that will make possible to roll out the proved solutions all across the organization identified in the previous phase.

Step 4.5.2 *Deploy the Solution Across Organization*: Deploy the selected solution across the organization following the Deployment Plan. Monitor and control the deployment.

Step 4.5.3 *Review and Capitalize Lessons Learned*: Review the results of the deployment and evaluate the magnitude of the improvement and whether the initial goals have been achieved or not. Document all the lessons learned, for future use in next improvement iteration.

These steps have been defined in accordance with the specific goal "*Deploy Improvement*" of OID in the CMMI [SEI/CMU 2008]. With the refining of the reuse strategy, another cycle of the improvement process starts from the first step of the RiSE-TCM guidelines (see Figure 2).

5. The RiSE-TCM Resources

The main actors that are involved in the RiSE-TCM process are the following:

Senior management: (i) Sponsors the Reuse Adoption/Improvement initiative; (ii) Provides the necessary resources for the Reuse Adoption/Improvement initiative; (iii) Oversees the Reuse Adoption/Improvement process performance; and, (iv) Identifies the need of new Reuse Improvement initiatives or the need of redirecting the existing one.

TCM Manager: (i) Ensures the consecution of the Reuse Adoption/Improvement program activities' objectives; (ii) Manages the RiSE-TCM team; and, (iii) Reports to the senior management the progress of the initiative and monitors arisen risks.

TCM team: Team responsible for executing all RiSE-TCM activities and reporting to RiSE-TCM Manager.

Pilot Managers: (i) Work together with the RiSE-TCM manager and the RiSE-TCM working group for translating the assessment results to the Transition plan design; and, (ii) Responsible leaders of the reuse pilot projects.

Reuse Technical Working Group: Working group composed of reuse experts who help the RiSE-TCM team in their choice of technical solutions and their implementation.

Assessment team: Team responsible of executing all reuse assessment activities and reporting to Lead assessor.

Lead assessor: Responsible leader for evaluating the status of a team/organization with respect to the software reuse practices capabilities maturity; and, (ii) Manages the Assessment team and is part of it.

6. The RiSE-TCM Tailoring

When an organization willing to experiment software reuse as a candidate solution to achieve its business goals, it decides to implement the RiSE-TCM guidelines herein, it should realize that, as it usually happens, "*one size does not fit all*", and it should tailor the formal RiSE-TCM process described in this paper so it can be feasible and agile in the organization's particular context. Therefore, the tailoring has to be done in accordance with the following factors [Garcia et al. 2007, Lucrédio et al. 2008]:

(i) The size of the organization: Although not the ideal situation, in cases where organization has limited human resources, the roles of the resources that intervene in the RiSE-TCM process may be overlapped in the same responsible person. The management plan will be limited to one plan gathering all the data. Software reuse development environment should be already validated in order to reduce the impact of their adoption.

(ii) The structure of the organization: The objectives should be the same at organizational or at project level. Management of resistance in adopting reuse, with changes

in the roles (developer, manager, tester), should take into account the possible divergences among the different management in the organization.

(iii) The level of process improvement (e.g., CMMI level): For organizations with high CMMI level the RiSE-TCM is similar to any other TCM process or development improvement initiatives. The change culture and infrastructure in the company is mature, and RiSE-TCM process could better focus on the technological part of the changes than in organizations with low or without CMMI level.

(iv) The change culture of the staff: When the people in the organization are used to implement changes in work structures and technologies, it is easier to develop any improvement initiative. The Reuse Adoption/Improvement Strategy Definition phase and Deployment phase of the RiSE-TCM process will be easier in this type of organizations, because the needed infrastructure and culture are already set up.

(v) The success of the previous changes: For next Reuse Improvement RiSE-TCM cycle, it is essential that the first software reuse adoption cycle has been successful or, at least, the new technology has been accepted organization-wide and its benefits have been proved to unit.

(vi) The skills and the kind of people in the organization (particularly reuse skills): When the organization is new to software reuse, the training might need to come from external sources and the process will need more time and effort. For RiSE-TCM team training also, it might be necessary to train the knowledge on other skills as organization's change request management and quality assurance procedures.

(vii) The initial level of maturity of the organization on software reuse: For organizations with low RiSE-RM maturity level, which carry out few basic reuse practices, it is recommended to undertake the software reuse changes in a stepped way, starting piloting reuse solutions in a small number of projects. Once the reuse maturity is higher, with more software reuse practices institutionalized and people used to work with reusable assets (documents, source code, components, templates, etc.), the pilots can be more ambitious and comparing several reuse solutions.

(viii) The level of reuse of the software: Reuse pilots should be designed in different ways whether the organization has a formal reuse culture or not. Besides, the level of specification of the reuse key assets for the deployment will need to be very accurate so they can be reused and maintained easily.

(ix) The level of stress: In organizations where several improvement initiatives could increase the level of stress of the people, strong leadership in RiSE-TCM team and strong senior management support will be necessary. Close relationship between both will lead to a better understanding and acceptance by every unit so the process can be as smooth as quickly as possible. In the same way, reuse pilot projects will not be designed on projects with thigh schedule or other challenges.

Project	Domain	Products	Size (members)	Status
Project 1	Web/Social network	1	9	Active
Project 2	Web/Mobile	1	4	Finished
Project 3	Web/Content Manager	1	3	Finished
Project 4	Web	1	4	Active
Project 5	Mobile/Content Manager	2	3	Active
Project 6	Embedded Systems	4	12	Active
Project 7	Design/UI	5	9	Active
Project 8	Mobile	14	40	Active

Table 1. C.E.S.A.R candidate projects

7. The RiSE-TCM in Action

Today, the RiSE group[2] is responsible for the software reuse efforts at C.E.S.A.R[3] (Recife Center for Advanced Studies and Systems), a Brazilian Innovation Institute. Currently, this company has about 700 employees and evaluated as CMMI level 3 in 2007.

C.E.S.A.R's reuse program was conducted according to RiSE-TCM guidelines and process, and is presented in this section. The first activity is related to sale the reuse benefits to the senior management. Some studies about success cases in industry [Joos 1994, Griss 1995], reports and surveys about success factors [Frakes and Isoda 1994, Rine 1997, Morisio et al. 2002, Lucrédio et al. 2008] were presented and discussed with the senior management. After this activity, the senior management agreed to start the reuse program.

7.1. First phase: Adoption/Improvement Reuse Strategy - Goals Definition

The senior management selected, summarized, some business goals as follows: increase the productivity, reducing maintenance costs and development efforts. However, according to the heterogeneous issue of C.E.S.A.R, that perform different projects in different domains at the same time, and each project can have their own process, technological environment, roles, etc., and consequently, will have their specific business goals, the reuse program should be conducted in a specific project, or in a set of projects, that allow this kind of technology change effort.

The Reuse Adoption Proposal was developed with this specific feature: the program was started to a special collection of pilot projects, that met the characteristics described above. In this way, the engineering department manager, with the RiSE team support, selected the candidate projects to participate in the reuse initiative at C.E.S.A.R.

A set of candidate projects was selected from the C.E.S.A.R's portfolio. The projects were classified according to the Table 1.

The sponsorship and needed resources were provided by the senior management. The technological infrastructure has been provided through the RiSE solutions [Garcia et al. 2006, Lisboa et al. 2007, Brito et al. 2008, Burégio et al. 2008] to aid the reuse practices.

[2]Reuse In Software Engineering, URL: `http://www.rise.com.br/research`
[3]URL: `http://www.cesar.org.br/`

RiSE team was responsible to monitor, coordinate and perform all activities to conduct the reuse program (i.e. training the projects' team in software reuse practices).

7.2. Second phase: Reuse Maturity Level Evaluation

In this phase, the evaluation of each selected project was performed in order to choose the pilot project(s) in the reuse program. The evaluation was focused on analyzing processes, methods, tools, business knowledge, technical expertise of the team and future market opportunities to the project. We used the RiSE-AM to evaluate the projects.

According to the evaluation results, RiSE team, in conjunction with the senior management, choose two projects: *Project 1* and *Project 8*, but for space limited question, only the *Project 1* reuse program execution is described here.

7.3. Third Phase: Reuse Adoption/Improvement Planning

In this phase, a software reuse plan was developed for *Project 1*. Based on *Project 1* evaluation results, could be noticed that this project has some practices related to the RiSE-RM level 2 [Garcia et al. 2007]. The goal was to implement other practices, in order to obtain some benefits. According to the results, *Project 1* had two clear trends to be investigated: **(i)** SOA and **(ii)** Software Product Lines.

Related to the *trend (i) SOA*, the main efforts were: **(1)** identify the services already available; **(2)** document the services availables, to increase the reuse potential; **(3)** publish the services documentation and make some tests; **(4)** identify new potential services to be implemented; and **(5)** plan the new potential services to be implemented in the future.

For the other trend (Software Product Lines), was developed a new plan. In the evaluation was identified the potential of the *Project 1* to build a software product line to the social network domain. The benefits of this effort, in a short term are: **(i)** a better understandability of the project business by the team; **(ii)** identification of new market opportunities for the product; **(iii)** identification of new functionalities for the product; and, **(iv)** decrease the maintenance cost for the releases (eight releases for different customers).

A transition plan was developed to aid in the *"transition"* from the current status of the *Project 1* to a more improved status, covering Software Product Lines aspects. Some responsibilities were defined to specific members, related to activities to improve the development process, documenting the software artifacts of the life cycle, and related to prepare the team and the product to migrate to a software product line.

7.4. Fourth Phase: Implementation of the Reuse Adoption/Improvement Pilot

In this phase, RiSE team aided in the cultural and educational aspects, promoting trainings in specific disciplines, such as: Introduction to Software Reuse, DBC, Domain Engineering and Software Product Lines [Almeida et al. 2007]. Moreover, specific trainings were performed to train *Project 1*'s team to use the RiSE tools [Garcia et al. 2006, Lisboa et al. 2007, Burégio et al. 2008] in order to aid in the reuse activities.

Project 1 team performed the Domain Analysis of the social network domain, documenting the domain, defining its scope, building a glossary, the product map of the analyzed applications (composed of 7 concurrent products) and the features model of the social network domain [Almeida 2007].

Figure 3, based on FODA [Kang et al. 1990] shows part of the feature model for the social network domain. Some features were implemented in the current product, such as: find users, forums, voting, notification and community creation. On the other hand, other features were not implemented yet such as blogging, topic recommendation and multimedia sharing.

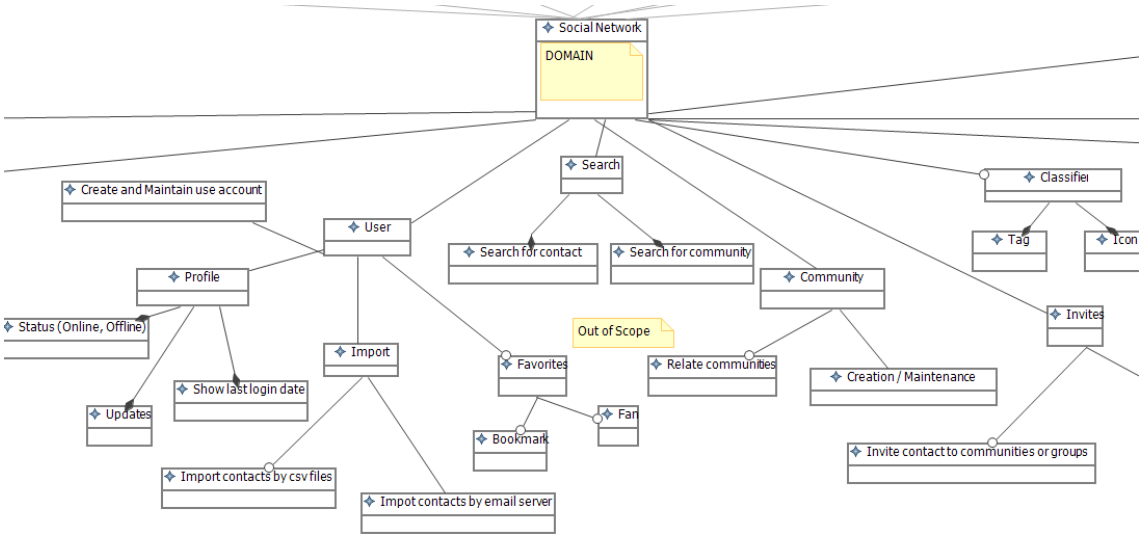

Figure 3. Part of the Social Networks feature model

7.5. Fifth Phase: Reuse Deployment

This phase has not started, yet. The reuse program is in the previous phase. *Project 1* is in the Project Domain activity, building the reference architecture of the domain. This activity is very complex because the product is in production, with 8 different releases to different customers running. An effective strategy of refactoring [Pashov et al. 2004] the old architecture to the new one, based on the domain analysis, is in course.

8. Concluding Remarks

This work presented a lightweight approach to reuse technology change management, called RiSE-TCM, that has been evaluated through an industrial project launched by a Brazilian Innovation Institute. The lightweight approach proposed was defined based on the RiSE expertise and practical experience in 5 reuse industrial projects, conducted since 2005. The five phases of RiSE-TCM complement each other in order to achieve a well-defined software reuse adoption process.

RiSE, in conjunction with the industry, aim to investigate the software reuse adoption area in order to: **(i)** determine which reuse adoption process characteristics should be considered; **(ii)** define a set of reuse adoption techniques; **(iii)** define a set of metrics to track the properties to the reuse adoption process; and **(iv)** build the software reuse adoption process framework which is responsible for defining a group of techniques, methods and models to aid in the introducing reuse practices in software organizations.

As future work, we intend to specify an effective metrics framework, with some suggestions and guidelines to aid in track and control the software reuse adoption process.

The long term plan is, clearly, to achieve a degree of maturity that could be used as a reuse capability adoption process standard for organization, making it possible to create, perhaps, a Reuse Capability Adoption Center.

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