The *ImprovAbility*™ Model

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*Too many improvement and innovation projects fail. We have studied characteristics of successful and failed projects. From this study, we derived 20 parameters that influence success and failure and used those parameters to build an Improvement Ability (*ImprovAbility*) Model, which is a model that can be used to measure an organization's or project's ability to succeed with improvement. After having built the* ImprovAbility *Model, we tested it in real life, learned from the experience, and improved the model. Further tests showed promising results. In this article, we report on the considerations and research behind* ImprovAbility. *Finally, we describe the method and how the model can be used in practice.*

Software Process Improvement (SPI) is about systematically evaluating current status in relation to software processes, doing something to improve, and measuring whether the things done improved the situation. Many information technology (IT) organizations have used considerable resources for SPI. However, investments in SPI often have not led to the changes and improvements as expected. For example, Goldenson and Herbsleb [1] found in a study of a fairly large number of organizations that had invested in SPI that 26 percent agreed that *nothing much has changed* and 49 percent declared themselves to be disillusioned due to lack of improvements. This study is not alone – several others have found that SPI initiatives can fail [2, 3, 4]. This leads to the research question that we address here: How can you improve an organization's ability to improve?

We believe it is possible and important to focus on the *ability to improve*, or if you like, improvability. In this article, we report on the findings from an in-depth study of successes and failures when improving and a model – called *ImprovAbility* – built from the results (see Figure 1). First, we describe our research methodology, a qualitative interview study with more than 50 interviews from four organizations followed by an action research undertaking to build a model of ability improvement. Second, we report the findings from the interview study and how our findings were grouped into 20 influential parameters. We then give an account of the model we developed based on the parameters and how that model can be used in two ways: One, to assess organizations' ability to implement innovations and improvements based on previous projects, and second, to assess ongoing projects to minimize the risks for the project henceforward.

™ *ImprovAbility* is a trademark of Delta Axiom.

Interview Study Research Method

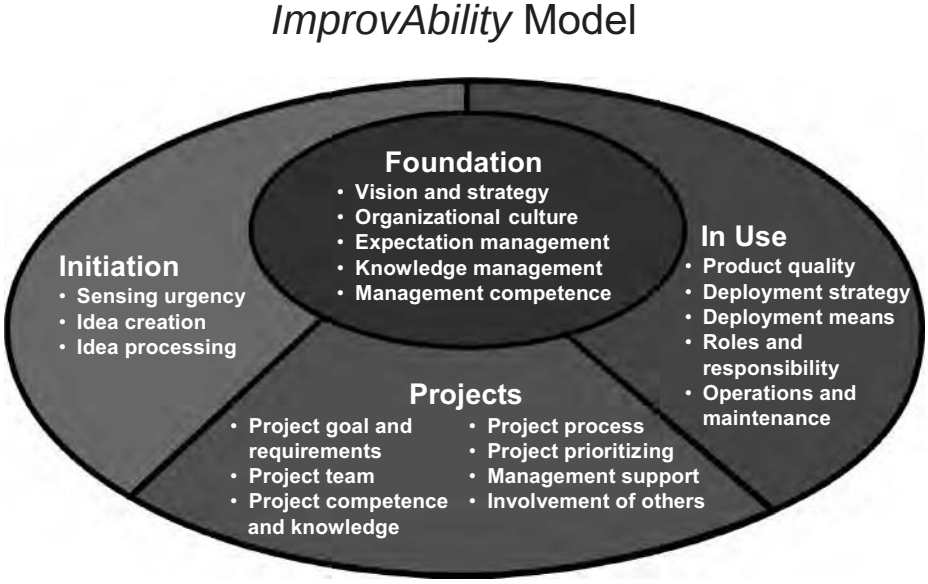
We selected successful and failed projects as an arena of particular interest from the viewpoint of improving the ability to improve. We can highlight two key reasons for this. First, we appreciate the learning that can be harvested by looking at projects in retrospect. Second, in opposition to many other studies, we decided to look at both SPI projects where other software developers are the users and at IT projects in IT organizations.

We used an existing research collaboration called Talent@IT[1] to select companies. There are four companies that participate in the research collaboration. Each of the companies was asked to appoint four projects, one successful and one failed SPI project plus one successful and one failed normal innovation project. Eventually, only 14 of the 16 projects asked for were available for our research; we included 12 scientific articles to widen the scope.

We then conducted interviews with personnel within the projects. We interviewed the project manager and one to two project members. We interviewed the sponsor or owner of the project, typically a manager in the organization. We interviewed the users; for an SPI-project, it signified other developers and for innovation projects, it typically signified end users. In 14 projects, we conducted more than 50 interviews in the period from summer 2003 to summer 2004.

Typically, every interview was conducted by two people and all interviews were transcribed and analyzed using Grounded Theory (GT) techniques. GT is a qualitative research methodology that derives its name from the practice of discovering theory that is grounded in data, i.e., this method does not begin with a theory, and then seek proof;

Figure 1: *Twenty Parameters in Four Groups for Success and Failure With Innovation and Improvement*



Vision and strategy	To what extent has the organization developed a business strategy and/or a vision that is decided and communicated?
Organizational culture	To what extent has the organization developed a culture that encourages improvement and innovation?
Expectation management	To what extent has the organization created systematic management of expectations in relation to both organizational changes and daily work?
Knowledge management	To what extent is knowledge systematically gathered, stored and used?
Management competence	To what extent has the organization developed the necessary competence at the management level?

Table 1: *Foundation Parameters*

Sensing urgency	To what extent is the organization able to sense the urgency for change? For example, because existing ways of working have become obsolete or because existing products are too old or maybe the organization has simply arrived in an untenable position.
Idea creation	To what extent is the organization able to identify, foster, and create many ideas for new SPI and IT processes or products? Preferably from many different sources such as user needs, new technology, or new strategies.
Idea processing	To what extent are new ideas captured and decided on?

Table 2: *Initiation Parameters*

Project goal and requirements	To what extent are project goals, expected benefits, and formulated requirements precise, unambiguous, and stable? Do the projects – developers as well as users – perceive their goals and the rationale behind as reasonable?
Project team	To what extent are the people allocated to projects highly motivated, and are they having the right attitude and profile for the projects? Is there a competent project manager on the team? Team sitting physically together and close to users? Does the team work as a team?
Project competence and knowledge	To what extent do the projects have the necessary technical knowledge? Domain knowledge? Development model and method(s)?
Project process	To what extent do the projects have good estimates, plans, follow-up, risk management, testing, and quality reviews?
Project prioritizing	To what extent are projects prioritized in relation to each other? And in relation to schedule, cost, scope and quality? Are priorities communicated and understood? Are priorities stable?
Management support	To what extent is management in the organization supporting the projects? This could include allocating the right resources at the right time, participating in a steering committee, or demanding results.
Involvement of others	To what extent are other stakeholders (than the team and management) involved? This could, for example, include early user involvement. External resources? Consultants? At the right time and in the right way?

Table 3: *Project Parameters*

instead, it begins with an area of study and allows the relevant theory to emerge from that area [5].

After having collected our interview data, we applied the three coding procedures of GT. According to [5], analysis in a GT approach is composed of three groups of coding procedures called open, axial, and selective coding. These procedures do not entirely occur as a sequence, but each overlaps the others and iterates throughout the research project.

The goal of open coding is to reveal the essential ideas found in the data. Open coding involves two essential tasks. The first task is labeling phenomena. This task involves decomposing an observation into discrete incidents or ideas. Each discrete incident or idea receives a name or label that represents the phenomenon. These names represent a concept inherent in the observation. The second essential open-coding task is discovering categories. Categorizing is the process of finding related phenomena or common concepts and themes in accumulated data and grouping them under joint headings, thus identifying categories and sub-categories of data.

In our analysis, we found 54 categories that all contributed to either the success or failure of a project. Three examples of categories are the following: user involvement, defect in product, and stakeholder involvement.

Developing a better and deeper understanding of how the identified categories are related is the purpose of axial coding. The first task in axial coding connects categories in terms of a sequence of relationships. For example, a causal condition or a consequence can connect two categories, or a category and a subcategory. The second task turns back to the data for validation of the relationships. This return gives rise to the discovery and specification of the differences and similarities among and within the categories. This discovery adds variation and depth of understanding.

The first part of the axial coding was done together by four people. Similarities and differences were noted and discussed. Categories and relationships were identified, discussed, corrected, and changed until a common understanding of the categories, sub-categories, and their relationships was reached. Concretely, we ended up with 19 categories. To distinguish the 19 categories from the 54 coming out of the open coding, we called them the *19 parameters*.

Selective coding involves the integration of the categories that have been developed to form the initial theoretical framework. Firstly, in selective coding, a storyline is either generated or made explicit. A story is simply a descriptive narrative about the central phenomenon of study and the storyline is the conceptualization of this story (abstracting). The storyline we ended up with was, in fact, a story that states that the ability of an organization to produce success and avoid failure – the ability to improve – depends on the organization's ability to cope with the following four groups of parameters:

- Parameters related to *initiation* of projects, i.e., ideas for new SPI or innovation projects.
- Parameters related to *projects*, from the very first hour until a result is taken into use.
- Parameters related to *results in use*, i.e.

from when the first user starts using the new process or product for the first time until full deployment. This can be a long period of time or a one-time delivery depending on the context.

- Parameters related to the enterprise *foundation*, i.e., the environment and conditions for projects in the organization (e.g. organizational culture, management style and competence, and expectation and knowledge management).

The *ImprovAbility* Model

Our first model included 19 parameters, but testing the model revealed the need for one more parameter: operations and maintenance as indicated in the In Use group (see Figure 1, page 23).

The resulting model with 20 parameters in four groups looks like it is depicted in Figure 1. The core assumption behind this model is that the parameters identified from successful and failed projects can be used to identify an organization's ability to improve by encouraging activity that has shown to be related to success and avoiding activity that has shown to lead to failure.

Each of the 20 parameters in the model is described in Tables 1-4.

For each of 20 parameters in the four groups we have formulated a number of questions. The questions are based on our observations (the transcribed interviews plus the 12 scientific articles) and the grounded theory coding.

An Example of Questions for a Parameter

Let us, as an example, take the parameter *deployment strategy* from the In Use group. In Figure 2, we have shown the questions we derived for this specific parameter. The figure shows part of a spreadsheet that can be used to measure the *ability to improve* by an organization.

Process to Measure Ability With *ImprovAbility*

To bring *ImprovAbiliy* into use we designed a process to be used in an organization by assessors from outside the assessed organization. The process includes a number of meetings and activities as shown in Figure 3.

The method for gathering information during an assessment is inspired primarily by the Bootstrap method [6]. An assessment starts with a preparatory meeting, where, respectively, the assessors and key persons in the organization

Product quality	To what extent are new processes and products that are deployed of high quality? Few defects? User friendly? Low complexity? Compatible? Efficient? Have relative advantages for the user?
Deployment strategy	To what extent is a deployment strategy for new processes or products decided? Are the related plans followed also when deadline pressure arises at the end of the project?
Deployment means	To what extent is the optimal mix of information, communication, education and training, plus marketing of new processes and products applied? Optimal mix depends on the context and is planned as part of the deployment strategy.
Roles and responsibility	To what extent are roles and responsibilities in relation to deployment and use well defined and enacted?
Operations and maintenance	To what extent is it possible to operate the product or process? To what extent is it possible to maintain the product or process?

Table 4: *In Use Parameters*

Deployment Strategy		N	P	L	F	NA
1.	To what extent is a deployment strategy for new processes or products decided on and followed?	Score: 50				
1.a	To what extent is there a procedure for selecting a deployment strategy?			X		
1.b	To what extent are risks in relation to deployment uncovered?		X			
1.c	To what extent is there a plan for deployment (time, milestones, responsibility)?				X	
1.d	To what extent are deployment strategies and plans followed?	X				

Note: Excerpt from spreadsheet with questions used to measure the ability for the parameter deployment strategy. The scale used is *N* for not (counting as zero), *P* for partly (counting as 1/3), *L* for largely (counting as 2/3), and *F* for fully (counting as 3/3). The score is then calculated as a percentage of fully answers on. Here it is (2/3+1/3+3/3+0/3)/4*100 = 50. *NA* = Not Applicable and does not contribute to the score.

Figure 2: *Deployment Strategy*

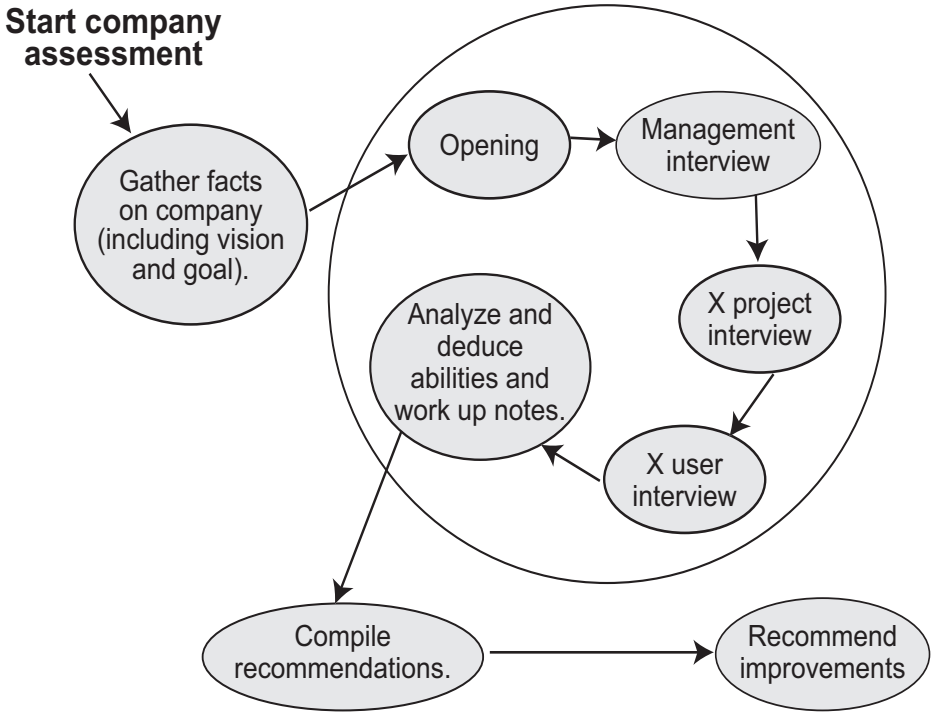


Figure 3: *How an ImprovAbility Assessment Is Conducted*

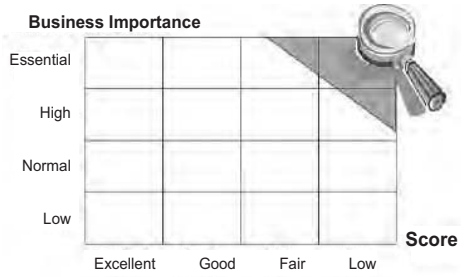


Figure 4: *Selecting Parameters for Improvement*

prepare for the assessment, gather facts on the organization, and clarify who is to say what at the opening meeting. This meeting is scheduled as one hour.

At the opening meeting, all persons involved should be present. At this meeting, the concept of the model and method, the purpose of the assessment, the plan and activities, the type of results, and the use and the results are explained in detail.

The data collection part of the assessment is a series of four hour interviews in the organization. Each interview includes two interviewing assessors and five to seven interviewees who are interviewed about each of the 20 *ImprovAbility* parameters. We start interviewing the management group and then follow with at least two project interviews in either process improvement or product development projects. The two project interviews must cover at least three projects. Finally we interview one or more groups of users of the same kind of products to make sure to cover the parameters from the *In-Use* group.

The interviews are carried out as open dialogues where the two assessors ensure that the discussions cover the subjects and all 20 parameters. After a group interview, the assessors answer the questionnaire in spreadsheet form(as shown in Figure 2). The spreadsheet generates a picture of strong and weak parameters on a scale from zero to 100. This is done for each interview.

When all interviews and scoring are complete, we have a measure of the strong (high scoring parameters) and weak (low scoring) areas in the organization. But in order to select parameters for improvement, it is also necessary to identify which parameters are important for the particular business. This is done during a prioritizing practice with management. In an open discussion, the managers are asked to prioritize the 20 parameters in four groups: very low importance, normal, high importance, and essential. Before they prioritize they are given two rules: at most three parameters must be essential, and at least three parameters should be low.

The 20 parameters are then positioned in a 4x4 matrix as shown in Figure 4. The x-axis represents the relative parameter score and the y-axis represents the priority given at the management meeting. In the upper right corner of the matrix, we now have the essential parameters with a low score and from that area we select three to five parameters for recommendations. It is here, for example, that we recommend that the organization focus their attention so they can improve their ability to improve.

To derive the concrete recommendation we use a catalogue of improvement methods and techniques. In fact as part of the *ImprovAbility* model we have a catalogue where for each parameter we can find inspiration on how to improve the concrete parameter. The catalogue is also a product of our coding of interview data for successful techniques and methods plus a literary study. A recommendation for the deployment strategy parameter could include – but are not limited to – the following:

Prepare deployment plans and make the following:

- Target group analysis (who, how many, when, how much) with an evaluation of the target groups pre- and post-condition.
- Risk analysis for deployment.
- Cost / benefit analysis.
- Definition of deployment roles and responsibilities.

During the assessment, factual data about the organization and its current strategic improvement initiatives are deducted. This is used to describe and illustrate the scope for the planned or already initiated changes. From studies of change management literature, we have identified 10 different change strategies. Some of the strategies have commonalities, others are quite different, and some are very much incompatible. It is therefore a difficult task for a company to choose the best change strategy, but as part of the research project we developed a spreadsheet based questionnaire to identify which strategy is best suited for a company facing a change. For example, Business Process Re-engineering (BPR) can be very useful in companies who are stuck and do not make money, where it would be a bad strategy to throw away all existing processes in companies who have their processes in place and make a lot of money. The best change strategy is identified during the management interview of the assessment and results in a prioritized list among the 10 change strategies in Table 5.

Finally, the assessors use all the collected data, parameter scores, the completed 4x4 matrix, the overall improvement practice, and the scope of strategic improvement initiatives to generate recommendations and produce a presentation for the closing meeting. The presentation is shown to management and afterwards shown to all involved in the

Table 5: *An Overview of the 10 Organizational Change Strategies*

Strategy	Definition
Commanding	Change is driven and dictated by (top) management. Management takes on the roles as owner, sponsor, and change agents.
Employee driven	Change is driven from the bottom of the organizational hierarchy when needs for change arise among employees.
Exploration	Change is driven by the need for flexibility and agility or a need to explore new markets, technology, or customer groups.
Attitude driven	Change is driven by a focus on organizational learning, individual learning and what creates new attitudes and behavior.
Metrics driven	Change is driven by metrics and measurements.
Optionality	Change is driven by the motivation and need of the individual or group. It is to a large degree optional whether the individual takes the innovation into use.
Production organized	Change is driven by the need for optimization and/or cost reduction.
Re-engineering	Change is driven by fundamentally rethinking and redesigning the organization to achieve dramatic improvements.
Socializing	Change in organizational capabilities is driven by working through social relationships. Diffusion of innovations happens through personal contacts rather than through plans and dictates.
Specialist driven	Change is driven by specialists, either with professional, technical, or domain knowledge.

assessment at the closing meeting.

Experiences Using the ImprovAbility Model

We have tested the model three times on the organizational level with promising results. In a medium size financial company, the manager of the IT Division (Chief Information Officer [CIO]) was most enthusiastic about the overall improvement strategy that we suggested. Based on our interviews we suggested that they used *attitude driven* and *socializing* as their main strategies for changing the organization and avoid re-engineering and commanding. The CIO called this the major *Aha!* experience for him as he had previously tried to create a burning platform, i.e., re-engineering and using a commanding strategy. In both cases, no changes really took place, so the CIO felt that the *attitude driven* and *socializing* change strategies made a lot of sense for him. At the closing meeting the CIO also committed to following the recommendations – not in detail but in principle. The other assessments were carried out in a large pension scheme enterprise and in the process department (SPI) in a privately owned software and systems company certified to CMMI Level 5. The results were appreciated as making good sense and reflecting their reality.

The Talent@IT partners identified a need for a special project level version of *ImprovAbility* where only a project team from an ongoing project is interviewed. In this case, the interviewees can only answer based on their expectations and experiences from previous projects. The outcome of the assessment is a focus on the risks for the project henceforth and the recommendations are used to reduce the risks of the project and increase their likelihood for success. We have tested the project version in nine projects from different business areas, covering projects of different size, complexity, and maturity level. We have seen a big variation in parameters for recommendation, but the data material is so far not big enough to spot any trends. However, we have seen that quite often *involvement of others* and the *deployment parameters* come up with weak scores, but further research has to confirm or invalidate that.

Conclusion

We are often asked how *ImprovAbility* compares with traditional maturity models like CMMI [7]. Our answer is that we have tried to group all the categories of our findings that were related to CMMI into the parameters of project team, project process, and project goal and requirements. This means for example, that if project process is selected for recommendation, the recommendation could include making a CMMI assessment to identify more precisely which processes should be improved first.

CMMI is a model that concerns the process behind product development and an assessment identifies which processes needs to be improved, i.e., what to change. *ImprovAbility* is not a maturity model but is a model that concerns the process behind *changing* the product development process. In other words, why do some have success with CMMI and others do not? So *ImprovAbility* is your concern if you want to identify how to organize and ensure success with CMMI based improvements, i.e., how to change. The organization assessment will help you improve the way changes are introduced into the organization, be it with new or improved processes or new product developments. Where the literature is full of change methodologies, *ImprovAbility* helps you define which one will work the best for you.

ImprovAbility is not a maturity model but is a model that concerns the process behind changing the product development process. In other words, why do some have success with CMMI and others do not?

The *ImprovAbility* project assessment is very useful to assist running projects in becoming successful. For process improvements a CMMI or International Organization for Standardization 15540 assessment is very useful to identify which development processes needs improvement. Once this has been done and a project is launched, the *ImprovAbility* project assessment can identify how to plan and minimize risk for the improvement project.

Finally, even though we have now reached a stage where we find it fruitful to report our findings in this article, we recognize the need for more tests. We have, therefore, already planned a fourth action research testing to consolidate and improve the model. So the story will be continued …◆

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Note

1. The Talent@IT is a three-year research project (2003-2006) sponsored by the Danish Ministry of Science, Technology and Innovation. The project partners are the IT-University of Copenhagen (research responsible), the Approved Technological Service Institution DELTA Axiom (project management and *owner* of the *ImprovAbility* model) and the four Danish enterprises ATP, Danske Bank, Payment Business Services, and SimCorp. More information can be found on <www.talent-it.dk>.

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Morten Korsaa has focused his 16 years professional career on development processes and improving their efficiency. He has been globally responsible for process improvement activities in a 2500+ developer organization and has experienced a significant number of process improvement projects. Korsaa brought this experience, plus the experience coming from maturity assessments in more than 60 projects, into the development of the *ImprovAbility* model.

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