Bringing Contextual Dimensions into The improvement of Information System Development Practices

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Abstract

Significant attention has been paid to the improvement of system development practices. There are theories and methods that are to be used for such improvement purposes. The criticism towards these theories and methods is that many of them have a narrow focus on the system development process, methods, and tools. Too little attention is paid to business orientation, organisational aspects and social factors. In this paper we present a framework that goes beyond this narrow focus in order to serve as a support for directing focus during improvement of system development practices. The development of the framework has been driven by experiences derived from four action research projects focusing on the improvement of system development practices. Generated categories from these experiences have been validated theoretically and internally through a multi-grounded theory development process in order to arrive at a practical theory.

1. Introduction

Significant attention has been paid to the improvement of system development practices. Examples of contemporary areas for such attention are Software Engineering, Method Engineering, and Software Process Improvement (SPI). As a professional and academic area information systems development is a challenging domain because information systems development is a complex and multi-dimensional phenomenon [8] [30]. Consequently, the improvement of system development practices also is a challenging issue to deal with [32]. Some challenges that are mentioned are: 1) the improvement of system development practice is quite a young discipline [30], 2) too few theories that can guide improvement initiatives. [36], 3) improvement initiatives often focus on the system development process, methods and tools which is a narrow focus that leaves out important aspects, such as business orientation [11], organisation and social factors [5] [8]. A majority of system development organisations express that they do not get any direct strategic value from software process improvement initiatives. [37]. Butler and Fitzgerald [8] argue that there is a need for both researchers and practitioners to better understand system development organisations, their practices and their development.

In this paper our point of departure is the need for increased understanding of system development practices and increased strategic value from such improvement initiatives. One way to deal with this is to go beyond the focus of system development process, methods and tools by taking aspects such as business orientation, organisation, and human and social factors into account. These aspects are also well recognised in organisational theories [7], strategy theories [25] and project management theories [38], which claim the need to be holistic and acknowledge the actual practice and context when dealing with change.

Based on the arguments above the purpose with this paper is to present a framework going beyond the narrow focus and to serve as a support for focusing aspects that need to be dealt with during the improvement of system development practices. The framework is a result of a Multi Grounded Theory (MGT) analysis of four action research projects.

The paper proceeds as follows. First, we deepen the discussion about how the improvement of system development practice is treated in research and the identification of different aspects addressed in different improvement initiatives. Following this we introduce our ontological base and its implications on how to conceive the system development practice (focus areas). This is followed by a description of our method in which action research has been chosen. Then, we present four action research projects as experiences from improvement initiatives in four different system development organisations. The short presentation of these projects is followed by a discussion where the emerging framework is discussed in relation to earlier presented theories. The paper is concluded with implications of the presented framework and issues for further research.
2. Related research: The improvement of system development practice

There are a number of theories and methods that put forward recommendations about how to conduct improvement of system development practices. These recommendations do also, to some extent, include what aspects (categories) to focus on in the system development practice. In this section we therefore give a summary of the recommendations in these theories and methods.

2.1. Theory-informed improvement

Mathiassen et al. [32] presents five principles that a system development organisation should adopt to succeed with their improvement ambitions. These principles are, 1) focus on problems, 2) emphasise knowledge creation, 3) encourage participation, 4) integrate leadership and 5) plan for continuous improvement [32]. The authors claim that the big challenge is to understand and bridge differences between formal and real practice (c.f. e.g. espoused theories and theories-in-use by Argyris & Schön, [3]).

To set the focus on practical problems is also in line with more recent approaches for improvement of system development practices like "the High Way initiative" [10]. This approach is, among three other approaches (Country Road, Cross Road, and Dead End), the one that is recommended [10]. An important dimension of knowledge creation is that there is a need to elucidate and share knowledge about the system development practice. Knowledge sharing needs to be both declarative (know-what) as well as procedural (know-how) [36, 33, 35]. Encouraging participation is an important ingredient to make changes happen [32]. Resistance to change is pointed out in “the High Way” approach and it is claimed that this can be reduced through involving those who will be affected by the change in the process (c.f. [9]).

Integrating leadership means that several levels of the system development organisation should be involved. The system development practice also needs to be aligned with different strategic and business oriented goals [9]. Management and leadership should both motivate and engage as well as put up guidelines for how to reach different goals [9, 24]. To have a plan for continuous improvement gives an opportunity to continuously stop and evaluate the progress in the present improvement initiative [32].

In addition and partly overlapping these five principles both Ravichandran [36] and Mathiassen et al. [32] present other aspects that need to be dealt with during an improvement initiative. One of these aspects is “state-of-the-art” which means that an effective system development process should be designed in a way that makes it possible to benefit and learn from new insights and modern models, methods and tools [36, 32]. The learning dimension is not restricted to models, methods and tools, though. Learning is a dimension spanning both the actual system development practice and the actual improvement initiative [32, 40]. Learning also includes competence development for encouraging staff members contributing both during the usage and the adaptation of the improved system development process [40].

None of the aspects above are isolated focus areas where we might ignore the context. The system development practice is maintained and developed through interaction between the system development process and the environment. It is the context of the system development process that, for each element in the process, clarifies why things are done, how things are done and when they are done [40].

2.2. Method-informed improvement

In addition to and often closely related to theories, different change concepts (methods) designed to be used for the improvement of system development practices can be identified. Examples of such change concepts are, Capability Maturity Model (CMM), IDEAL (Initiate, Diagnose, Establish, Act and Learn), Bootstrap and SPICE (Software Process Improvement and Capability determination). These change concepts build on the principle of diagnosing the system development practice as a base for improvement. In three of these change concepts (CMM, Bootstrap and SPICE) this is done by using different maturity levels as ideals [35, 45]. The main purpose with CMM, Bootstrap and SPICE is to learn about the current maturity level, to bring improvements to higher levels and to support the continuous evaluation of the improvement process. IDEAL, on the other hand, does not have these maturity levels. IDEAL is a change concept which in relation to the other three concepts is more prescriptive in character [11]. IDEAL is more explicit about how to perform different development activities while CMM, Bootstrap and SPICE have a stronger focus on what aspects to deal with in the system development practice. To give an idea of the aspects that are in focus in maturity levels CMM is used as a summarizing example.

CMM defines five levels of process maturity [24]. At level 1, the practice does not make or follow plans. None or few processes are defined and/or followed. Formal management practice and control is more or less nonexistent. At level 2, basic standard planning practices are followed. Procedures for sharing knowledge and best practices are emerging. The system development process is understood and the usage of formal support (models, methods, tools, etc) is
initiated. At level 3, the foundation for effective measurement is established. Procedures for knowledge sharing and best practices are established. The system development process is defined. System development processes are also customised based on project-specific characteristics. At level 4, quality and management systems and common practices are established. Business-oriented strategies, goals and procedures are integrated in different measurements. At level 5, the focus is on process management. Continuous adaptation of the system development process is established. All members feel responsible for the system development practice.

In addition to these change concepts for software development, one can also use more general change concepts. One example of such a method is Change Analysis according to SIMM (CA/SIMM) [18]. CA/SIMM is a change concept for the early stages of information systems development. CA/SIMM is based on a participative perspective with a focus on situation-adaptable business development. CA/SIMM has a framework with a number of phases where the phases are made up of different method components that can be situatively applied. Examples of method components in CA/SIMM are: Problem analysis, Goal analysis, Strength analysis, Resource analysis, Concept analysis and Process analysis. The concepts and categories that constitute the method components in CA/SIMM are not as specialised as the categories in the other change concepts. In CA/SIMM it is rather the specific content of problems, goals, strengths and processes that makes CA/SIMM situation-specific. CA/SIMM is the method that has been used as a change concept in the four action research projects that will be presented later.

2.3. Summary

The two sections above describe different aspects (what) to focus on and to deal with in system development practices during improvement initiatives. In short these aspects can be summarised into the following categories:

- Business strategies and goals
- Environment and context
- Instrumental support (model, methods, tools, etc.)
- Knowledge (creation, sharing and learning)
- Leadership and management
- Planning, coordination and follow-up
- System development process

A different dimension that is also described in the sections above is how to deal with improvement initiatives, which can be summarised as follows:

- Focus on actual problems in the system development practice
- Participation in the improvement initiative
- Facilitation of learning and knowledge creation
- Continuous improvements

3. Ontological foundation for system development practices

The task of improving system development practices requires an understanding of what to direct attention to during such initiatives. In this paper, frameworks for guiding such improving initiatives are conceived as a domain ontology [23] covering areas to focus on. This requires a congruent ontology for categorising essential aspects to be acknowledged. Since system development practices are to be conceived as actions in which both human beings and artefacts have a central role, a common (base) ontology capturing both social and instrumental dimensions is needed. Work practices are constituted by actions performed by human beings and artefacts, and the purpose of these actions is new/refined artefacts in conjunction with the work practice in which the artefact is a part. Such an ontology would also be an aid in the aspiration to expand the scope of what we pay attention to during the improvement of system development practices. In this section a (base) ontology [23] will be introduced. The (base) ontology, socio-instrumental pragmatism (SIP), describes general social domain concepts.

Socio-instrumental pragmatism (c.f. [19, 16]) incorporates human, organisational, and IT-enabled actions in a coherent ontology. This foundation stresses the importance of viewing the world through “lenses” of actions. Actions performed by humans, organisations and artefacts can be captured in this way. Such an ontology is needed to capture and structure categories in the emerging framework, which will be presented later, to direct focus during the improvement of information system development practices. The concern of theorising action has also been acknowledged by actor-network theory (ANT) (c.f. [26]), where technology and people are both seen as social actants. Goldkuhl and Agerfalk [21] do however posit that there is a need to acknowledge the social in the technical and the technical in the social. As identified by several scholars (e.g. [21, 34]) the specific character of artefacts, in this study models, methods, tools, handbooks etc. used in system development practices, must be acknowledged. Within socio-instrumental pragmatism similar and diverse properties of human and artefact-enabled actions are acknowledged. According to socio-instrumental pragmatism an action is a purposeful and meaningful behaviour of a human being or artefact acting on behalf of a human
being. Humans act in order to achieve ends [43], often with the purpose of achieving material changes. This gives rise to different types of actions, such as strategic, tactic, and operative actions in relation to the focused area of concern. An enterprise consists of humans, artefacts and other resources, and its performance of actions. Humans (often supported by artefacts) perform actions on behalf of the organisation [2, 42] which therefore also needs to be captured in a framework for directing focus. Human action is about making a difference and impact in the social world as well as in the material world [43]. From an organisational point of view this means that the result of the development practice becomes a concern. A social action is an action oriented towards other persons [44], and actions can be communicative or material. Austin [4] and Searle [39] claim that to communicate is also to act.

A social view on system development practice has a long tradition in IS research. Resulting IS/IT solutions and architecture are closely related to human actions, which in turn are closely related to business plans and strategic goals. Since information is something that is said by someone to somebody, such a view on system development practice, IS/IT solutions and architecture becomes closely related to communication and business languages (c.f. [29]). A social and organisational view for understanding information systems development has been handled based on linguistics [13, 17, 46] and semiotics [41].

4. Research method

Our choice of method was in all four cases action research because this method has proven to be useful in a certain type of research settings (cf. e.g. [28]). Action research has been described as a research method suited to study technology in a human context [6], which is a core focus in the IS discipline. In this case, this means the study of practices in which development of information technology as an integrated part of another practice is performed. The improvement of a system development practice thus has to be considered in a human context. Our aim with this paper has been to develop knowledge that is useful for both research and practice - an initial framework for directing focus during the improvement of information systems development practices. We rely on the same arguments that are put forward by Lindgren et al. [28] where they express (based on Mathiassen [31], pp. 441) “Merely studying a real-world problem without assisting to resolve or ameliorate it is perceived as unhelpful. In other words, action researchers see it as their responsibility to assist practitioners by not only developing but also applying knowledge”. As pragmatists we see the goals of social science to be oriented towards creating scientific knowledge that is of practical value. Such a view has its roots in practical inquiry mainly inspired by Dewey [12], and as stated by Goldkuhl [14]: practical inquiry and action research resemble each other to a high degree. Given this epistemological stance research should be done by inter-related processes of action, design, interaction, and reflection.

Validity claims raised for our scientific contribution are in accordance with multi-grounded theory (MGT) [15], i.e. that the knowledge is internally, empirically and theoretically validated. In this paper we raise such claims for categorical knowledge about what aspects to focus on during improvement initiatives. These categories are derived from the action research projects as well as from theoretical standpoints held by others. MGT has thus been adopted in a combined inductive and deductive research approach for the analysis. MGT is a reaction to grounded theory and its purer inductive approach. MGT is a process for theory development in three integrated steps that also include steps like theory-informed open, axial and selective coding. The first step is theory generation, the second step is explicit grounding and the final step is research interest, reflection and revision (cf. [15]). Given the fact that a pragmatist view on knowledge is adopted the result of an MGT process is knowledge as practical theories. A framework for directing focus, as a practical theory, is a prescriptive concept to be categorised as a theory for design and action according to Gregor [22]. The categories constituting the framework are empirically derived from the action research projects, theoretically validated, and internally validated through the (base) ontology.

5. Improvement initiatives in four system development practices

The empirical findings that are presented in this section are the result of a MGT analysis of four action research projects and the improvement initiatives in four different system development organisations.

The four cases will be referred to as, the Public Authority, the Pharmaceutical Company, the Software Engineering Company and the Consultant Firm. The projects in each of these system development organisations are spanning different time periods; the public authority (33 months during 1997 – 2000), the pharmaceutical company (6 months during 1998), the software engineering company (21 months during 1999 – 2001) and the consultant firm (19 months during 1999 – 2001). Their system development practices have both similarities and differences. Table 1 below is a summary of what part of the organisation that was concerned and their main practice.
In all these improvement initiatives there is just a part of each total organisation that has been involved. In the two first cases (the public authority and the pharmaceutical company) the main purpose of the system development practice was to support their own organisation’s operative work. In the other two cases (software engineering company and consultant firm) products and services were developed for external clients. In all of these four improvement initiatives there are a number of aspects that have been in focus in the task of improving each system development practice. As pointed out in section four above the analysis of the cases has followed the principles of MGT which has generated a number of aspects that have been grouped into categories. Examples of two such categories and their contents are presented in table 2 below.

After having analysed (through MGT) the actions taken and the aspects that were in focus in these change projects there were 11 main categories that emerged as important aspects to focus on during improvement initiatives. These categories do not, however, stand alone. They have different relations to each other since they as parts make up a wholeness related to system development. Due to space limitations these relations between categories are not discussed explicitly in this paper.

**Strategic planning:** This category addresses different types of plans that need to be set to guide future actions. Aspects of strategic planning that have

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**Table 1: Part of organization and their main practice**

<table>
<thead>
<tr>
<th>Part of organisation</th>
<th>Main system development practice</th>
</tr>
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<tbody>
<tr>
<td><strong>Public authority:</strong></td>
<td></td>
</tr>
<tr>
<td>System development division</td>
<td></td>
</tr>
<tr>
<td><strong>Pharmaceutical company:</strong></td>
<td>Development and maintenance of administrative information systems to support the research and development process for drugs</td>
</tr>
<tr>
<td>System development section</td>
<td>Evaluation of information systems</td>
</tr>
<tr>
<td></td>
<td>Knowledge procurement within the organisation</td>
</tr>
<tr>
<td></td>
<td>Refinement and maintenance of methods and work procedures for system development</td>
</tr>
<tr>
<td><strong>Software engineering company:</strong></td>
<td></td>
</tr>
<tr>
<td>System development department</td>
<td></td>
</tr>
<tr>
<td></td>
<td>System responsibility for the product and the development of OSS</td>
</tr>
<tr>
<td><strong>Consultant firm:</strong></td>
<td>Development of internet based IT-solutions for customers:</td>
</tr>
<tr>
<td>System development team</td>
<td>o Business to Business</td>
</tr>
<tr>
<td></td>
<td>o Business to Business &amp; Customer to Business</td>
</tr>
<tr>
<td></td>
<td>o Customer Relation Management</td>
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<tr>
<td></td>
<td>o Customer to Business &amp; Customer Relation Management</td>
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</tbody>
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**Table 2: Example categories from the MGT analysis**

<table>
<thead>
<tr>
<th>Category</th>
<th>Aspects in focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>System development process</td>
<td>Model, method and tools (existing and new)</td>
</tr>
<tr>
<td></td>
<td>Knowledge about the system development process</td>
</tr>
<tr>
<td></td>
<td>Knowledge about new conditions (platform, architecture etc.)</td>
</tr>
<tr>
<td></td>
<td>Transfer and management of knowledge and experiences</td>
</tr>
<tr>
<td></td>
<td>Quality goals: lead time, productivity, efficiency etc.</td>
</tr>
<tr>
<td></td>
<td>Development process, phases, action logic, prerequisites, result, roles, responsibility</td>
</tr>
<tr>
<td></td>
<td>Decision process and decision structure</td>
</tr>
<tr>
<td></td>
<td>…</td>
</tr>
<tr>
<td>Instrumental support for system development</td>
<td>Models (existing and new)</td>
</tr>
<tr>
<td></td>
<td>Methods (existing and new)</td>
</tr>
<tr>
<td></td>
<td>Tools (existing and new)</td>
</tr>
<tr>
<td></td>
<td>Templates (existing and new)</td>
</tr>
<tr>
<td></td>
<td>Checklists (existing and new)</td>
</tr>
<tr>
<td></td>
<td>Patterns (existing and new)</td>
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<td>…</td>
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</table>
shown to be important for system development practices are for instance, products, services and concepts that should be produced for different (internal and/or external) clients. Strategic planning also includes formulated goals for improvements and what to strive for. Strategies are often more long term while business planning often is made for one year at a time. Since these aspects affect the system development practice they also need to be elaborated during the improvement initiatives.

**Products and services:** Products and services that a system development organisation offers are a part of strategic planning and they will have certain characteristics. These characteristics will govern how it is possible for people to perform, and how people should conduct different activities in the system development process. Depending on how people behave in the system development practice this will affect the characteristics of the products and services that are delivered. The result of a system development process usually is not just about a new or changed artefact. In many cases this type of development effort also includes development of the practice as a whole where the artefact is one part of the total change.

**System development process:** Not surprisingly, this category has emerged as a category of its own. This category and the category Project management, see below, are the two core categories in the system development practice. System development processes are often the first aspect of the system development practice that is focused. This is however a rather complex category that involves a lot of aspects (other categories) of the system development practice. Related to the system development process there is for instance often a need to address different types of instrumental support for the process, e.g. theories, models, methods and tools. Instrumental support gives guidelines for what, how and why actions should be performed. Another important aspect related to this category is know-how which is an important ingredient in the system development process and the other categories.

**Project management:** Within project management there are also different types of support that need to be addressed. Know-how is an important aspect of project management and there can be different needs to reconstruct and develop procedures to share know-how about project management. The same goes for the system development process category above. Another aspect that is an issue is the alignment of the system development process and project management. Different milestones and tollgates in the project management process need to be aligned with different phases in the system development process.

**Collaboration and communication:** This category deals with the need to provide arenas and procedures for collaboration and communication. An important aspect of this is to address different forums where people can meet to share information and communicate. Another aspect of this is to visualise information and make the information itself as well as decisions accessible.

**Decision making:** Decisions often constitute an important prerequisite for continuous system development work. Important aspects concerning decisions are: which decisions have been taken, who is making the decisions, where are they made, decision consequences on system development work and incentives as motivation to accept and respect taken decisions.

**Know-how:** Know-how is a critical resource for system development and concerns activities, such as utilisation, development, sharing and maintenance. Individuals can have know-how related to all presented categories. Know-how is a prerequisite for all actions in a system development project and is therefore also an important aspect to elaborate.

**Development resources:** A critical recourse for system development is know-how. Other resources that also need to be taken into consideration are time, financial resources and accessibility of resources.

**Development tools:** Development tools are different types of support that can be used during system development. Development tools can take different shapes, such as theories, models, methods, check lists, templates etc. Since different types of tools are used during system development there is a need to direct attention towards these tools during improvement initiatives.

**Technical infrastructure:** Technical infrastructure can facilitate and restrict what is possible to do in the system development process. Technical infrastructure that might need to be addressed is: system architecture, platforms and base software. Technical infrastructure can also be a part of the product that is being developed and a prerequisite for developing the product.

**Organisational context:** This category addresses aspects such as, organisation, geographic spread, leadership, culture, work environment etc. All these aspects are traditional organisational aspects but nevertheless they need to be dealt with during improvement initiatives. The organisation and its context will always have an effect on how people behave and what is possible to do and achieve in the system development practice. For instance, if rewarding structures are only based on how individuals perform, they will then probably need to be revised if
one goal of the system development practice is to develop sharing and spreading of know-how.

6. Discussion: towards a framework for directing focus in information systems development practices

In the history of the improvement of system development practices there have been different things in focus during different time periods. Mathiassen [30] describes this as three eras with different challenges for system development. The first era starts in the early 60’s to the middle of the 70’s. During this era the focus was on methods, tools and project management. During the second era, mid 70’s to the late 80’s, the attention was on quality assurance and CASE tools. During the third era, late 80’s until today, the focus has been on Software Process Improvement (SPI). In the criticism of SPI we can recognise that improvement initiatives are not believed to have had a significant effect on many software development practices [11].

The recommendation is that we need to widen our scope in a couple of dimensions if we want to succeed in the quest for improving system development practices. The first dimension is the lack of business orientation [11]. The second dimension is the need to deal with organisational and social aspects [5] [8]. The third dimension is the choice of implementation strategy [10]. The implementation strategy should have a clear focus on solving actual problems and a clear management support [10] [1]. A fourth dimension is the need for resources for improvement initiatives and know-how about how to improve these types of practices [1].

In the dimensions that are presented above and the summary of categories in section 2.3, there are actually two levels that are more or less intertwined and overlapping with each other:

- What aspects to focus on and how to deal with the improvement project (meta-development level)
- What aspects to focus on and to deal with in the system development practice (development level)

Our experiences from a number of different SPI projects are that these are more or less "two sides of the same coin". This means that the categories that have been presented in section 2 (related research) and section 5 (four action research projects) to a great extent are relevant for both levels.

In a comparison between the categories from theory (section 2) and the four cases (section 5) one can observe both similarities and differences. After a comparative analysis of the categories from section 2 and 5 we have come up with the following suggestion of categories that we need to deal with during the improvement of system development practices:

- Collaboration, Communication & Learning
- Development resources
- Development tools
- Know-how
- Leadership, Management & Decision making
- Organisational context
- Products and Services
- Project management
- Strategic planning
- System development process
- Technical infrastructure

The empirically generated categories have been theoretically validated through the MGT analysis. This process has refined the empirically generated categories. This refinement means, for instance, that the first category “Collaboration and Communication” has been complemented with learning and the fifth category “Decision making” has been complemented with Leadership and Management. What can be revealed from this comparison is that we have extended the existing scientific body of knowledge by adding developed dimensions to the improvement of system development practices.

Based on the metaphor “two sides of the same coin” some comment can be made about these categories. There are, for instance, three categories that do not have a clear relevance on the meta-development level of the improvement project; Products and services, Strategic planning and Technical infrastructure. The actual improvement project does not have predefined and articulated products and services that should be developed. It is rather the situatively defined results from the improvement initiative that need to be addressed. We might nevertheless argue that the changed system development practice is a product, the refinement of a client’s practice, which would fit on the meta-development level. Strategic planning is an activity that you do for the system development practice level but it is not usual that you make a strategic plan for the total structure of improvement initiatives in the same way. It is also a bit unclear if you actually have a technical infrastructure for delivering results in the improvement projects as such (meta-development level). In one of our action research projects (the consultancy firm) we could however observe this in what was called “The handbook”. This was an actual
result that was to be used by the consultancy firm in their real project and at the same time the handbook served as an important generative and structuring facilitator for the improvement project. The categories have also been grounded in the base ontology (SIP) presented earlier where the ontology has served as a basic generative foundation for what to acknowledge in the categories and how to structure them in the emerging framework. The structure of the framework has also been grounded in a generic practice theory (ToP), which distinguishes between infrastructural and transactional dimensions (c.f. [20] for ToP). Since system development in many aspects is regarded as a process we have also adopted a process theory as a generative source in structuring the framework. The structure of the framework has also been grounded in a generic practice theory (ToP), which distinguishes between infrastructural and transactional dimensions (c.f. [20] for ToP). Since system development in many aspects is regarded as a process we have also adopted a process theory as a generative source in structuring the framework (c.f. [27] for process types). The framework that we suggest is according to the figure below:

**Figure 2: Framework for directing focus**

In the upper part of the framework we have put forward prerequisites and abilities that are needed for system development practices based on the infrastructural dimension in the practice theory (ToP) [20]. Aspects that are expressed here are *know-how, development resources, development tools* and *technical infrastructure*. These categories are important to address in order to realize desired and expected results in terms of different *products* and *services*. We adopt process-oriented thinking, relying on both transformational and coordinative foundations (c.f. [23]), in the realisation process which evidently results in categories such as *system development process* (as transformational dimension) and *project management* (as coordinative dimension). From the process perspective and in connection to realisation we also need to handle conditional processes such as *strategic planning* and the result of the process in terms of *Products & services*. In relation to these process categories we also need to address the lower part of the framework. The lower left part is about management in general but leadership and decision making are also put forward as important. On the right side social and communicative aspects founded in the applied (base) ontology (SIP) is accentuated when we are focusing *collaboration, communication and learning*. The system development practice is then always performed in a social and organisational setting that also affects all other categories in the framework. This is expressed through the category *organisational context*. This category has partly been refined and made explicit through the other categories in the framework but there are still a number of dimensions left in the organisational context to qualify as an own category. Organisational context can involve a number of different aspects such as organisational structure, reward systems, social factors, culture, norms, rules etc. These factors can be formally expressed or tacitly understood in the organisation but regardless of their character they need to be addressed and evaluated.

7. Conclusion

An important lesson from having analysed four action research projects, SPI theories and SPI methods is the obvious need to go beyond a narrow focus and expand the scope. It is not enough to just focus on the categories that are utilised in existing SPI methods. The presented framework is an attempt to meet this and to structure and refine a number of categories that need to be focused and dealt with during improvement initiatives. Through its elaborated structure and categories the framework operationalise what is needed to deal with during improvement initiatives. Through its structure and categories parts of the organisational context are made less fuzzy by making some organisational aspects become explicit categories. Since the framework is more exhaustive than existing methods it also makes it easier to evaluate what to focus and how to deal with different aspects during planning and realisation of an improvement initiative. The improvement projects will always require you to take the actual situation into consideration and make adaptations.

The framework with its categories has a dualistic role during the improvement of system development practices. The categories in the framework are relevant for what we need to focus on and deal with on both the meta-development level and the development level (c.f. figure 3 below). This conclusion is quite natural since both practices deal with development, but have different objects (practices) in focus for the development effort. It is therefore important to be serious about both levels since the success will be dependent on that we can manage both levels. On the actual meta-development level, in addition to the framework, we also need to deal with work procedures such as focusing on actual problems, ensuring
participation, facilitating learning and preparing the practice for handling continuous improvements.

**Figure 3: The framework and development levels**

In the generation of the framework it has been fruitful to use a base ontology (SIP) as a generative and structuring base for the framework, i.e. to understand and structure the role of humans, actions, artefacts and the social world in a context of improvement of systems development practices. It has been supportive to utilise a solid ontological foundation for coping with a too narrow focus on system development practices during improvement initiatives. In the same way it has also been beneficial to use a practice theory (ToP) and a process theory as a generative and structuring base for the framework. Theory of practice has helped to elucidate actions, prerequisites and abilities for actions and results of actions. The process theory has helped us to elucidate transformation and coordination dimensions of the framework.

Given the fact that the categories constituting the framework have been generated on empirical, theoretical and ontological basis it can be claimed that the probability of being successful in taken initiatives to improve system development practices will be raised.

Rational arguments for the presented framework has been generated on solid scientific foundations by adopting a Multi Grounded Theory approach. The next step in this research endeavor is to empirically validate the framework by putting it into application and use it in combination with different methods. One part of such validation process would be to validate the relevance of each category and thereby generate theoretical and empirical arguments for the value of adopting such framework during improvement of system development practices.

**8. References**


