Enterprise innovation planning with social software

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Abstract: Enterprise Innovation Planning (EIP) is proposed to manage discontinuous or breakthrough innovations. In this paper we make use an analytical and interdisciplinary model of discontinuous learning to manage novelty. Novelty Action (NA) refers to the necessity of acting, in general, to learn the inherently unknown. With our model five NA-processes are involved, where one is just a mediator. For innovation we accordantly propose four management systems, each relates to a specific managerial challenge. The mediating process will connect all the management systems so that they can simultaneously build the innovation. This way each management system provides leverage or breakdown to the innovative learning process. The learning path for discontinuous innovation is iterative, but alternating between two types of learning. A complexity capabilities framework is suggested and a social software shell should facilitate its use. The IT-alignment will itself be a managerial challenge, which dominate the ongoing research agenda.

Keywords: discontinuous innovation; breakthrough innovation; strategic management; social software; IT-alignment; complex systems and cognitive cybernetics.

1 Introduction

The understanding that ideas can come from anywhere, and that management should be able to cope with this, makes the management of innovation a hard problem. Especially if a sustained-flow of innovation requires the management of discontinuous innovation. Discontinuous innovation was first described by Schumpeter (1975) as "creative destruction". According to Mokyr (1990) long-term industrial growth is based on such Schumpeterian growth and traces can be found throughout our entire history of technology. The term discontinuous innovation has been more explicitly used by Hamel and Prahalad (1994). They suggest incremental development processes to manage it. Christensen (1997) suggests theory as a solution to discontinuous/disruptive innovation, because data on profit only provides feedback about the past. By adding theory to discontinuous innovation, we see new opportunities, to build a disruptive growth engine (Christensen 2003).

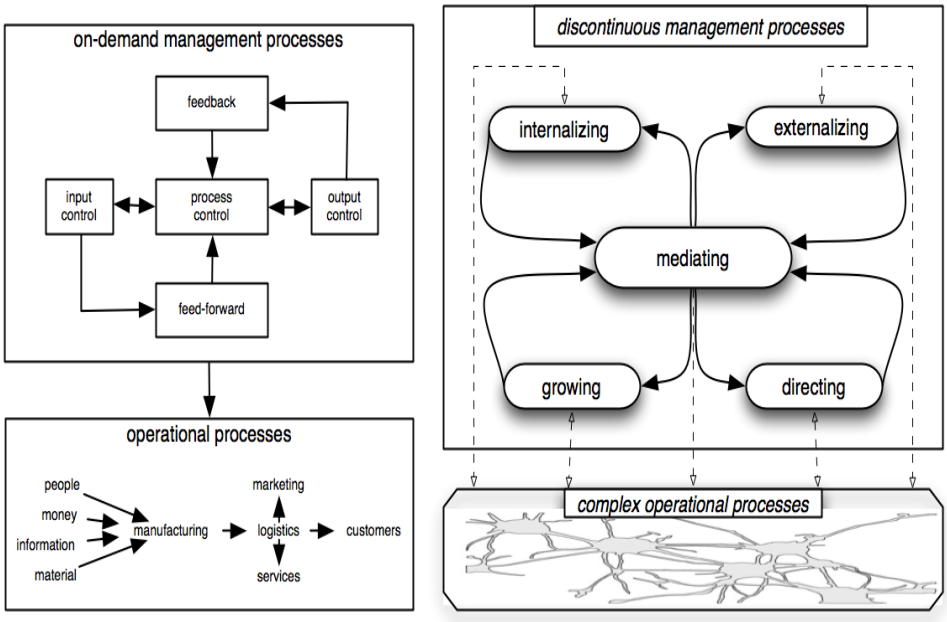
While creative destruction may primarily be a concern in innovation management, there are plenty of other disciplines that are working on the same topic for different reasons and by different names. From a system and cybernetic perspective there is the "Complex Adaptive Systems" paradigm of Holland (1995) and theories on “the artificial” by Simon (1969, 1996) that both deal with discontinuity and fabrication as a natural phenomenon to cope with complexity. The cross fertilization between system thinking and economics can also be found with Moore’s business ecosystems (1996). Science studies of Latour (1979, 1987, 1999) and his actor-network theory (2005) are highly relevant to understand the behavior of socio-technical systems. Ackerman (2000) addresses the relation between socio-technical systems and social software. We have also been experimenting with new methods to research creative destruction, based on agent theory. The first model was an artificial simulation to understand the limits and the control for an agent to produce a creative action (Kiemen 2003, 2006). Discontinuous learning is situated learning, triggered when reality confronts us with gaps in our knowledge. Indeed, these are the situations where sudden new insights arise, which still need to be tested in order to become useful. Acting on insights can turn out in unexpected effects. Latour (1999, pp 298) expressed it nicely: "actions are slightly overtaken by what it acts upon". What is unexpected or recognized as unknown, is novelty. It would never emerge without actions. To this end, we use the concept of Novelty-Action (NA). Different disciplines have been analyzing discontinuous learning, under different names, but have come up with a similar NA-model (Kiemen 2008). The NA-model as regulator of discontinuous learning is a theory, the model is expected to be corrected by empirical experiments; it will be overtaken by actions. By building an Enterprise Innovation Planning (EIP) system as the practical counterpart to the novelty theory, we expect both the system and the model to mutually correct each other. The EIP-system is expected to be a so-called social enterprise, built as a web 2.0 solution. Social software can harvest experience and opportunities in a situated setting, while the EIP-system should reduce the resisting effect of experience. Knowledge is both a barrier to and a source of innovation (Carlile 2002). It may seem contradictory, but boundaries are needed to think outside the box. The question is which boundaries are useful and which are harmful. This is where the theory can help. We first introduce the NA-model as regulator of discontinuous learning. Then, we outline our current suggestion for the EIP-system. The third part should give an idea of how the EIP-system is built as social software and how we plan to undertake the empirical part of this research.

2 The NA-model, Mastering and Reflection

Learning takes place in a person or in a group, resulting in creativity at the individual/cognitive level or innovation at the collective level. Where an individual can imagine concepts and create behavior, organizations can imagine markets and create products or services. Of course this is an oversimplified view it is only an introduction. By using the cognitive case as control group we develop a similar regulator for innovation. In past papers the novelty theory has been illustrated by cognitive examples (Kiemen 2006, 2008). The NA-model is a complicated system, existing in total of five parallel processes: internalizing, externalizing, directing, growing and mediating. Such a complicated structure is needed to regulate novelty. In figure 1 we have classic on-demand management processes next to our discontinuous management processes. The

on-demand system only needs to deal with requests and uses an anticipation control for it. An anticipation control exists out of a feedback and a feed-forward entwined. Anticipating means expectation, not certainty, the feedback will only correct after the event has already happened and thus allows to better deal, via feed-forward, with coming events. The on-demand structure is relatively simple as it regulates well-known operational processes. Our novelty model has to deal with an operational complex. There is no simple solution, regulation and shaping happens simultaneously. The semi-structures and semi-regulators will be tested against each other and emerge to a regulator. The central mediating process let the other four anticipating processes interact with each other. Internalizing will anticipate a model of the complex, externalizing anticipates actions, directing anticipates opportunities and motivations. Directing will give more control over what is internalized and externalized. Growing, then, will anticipate based on prior-experience.

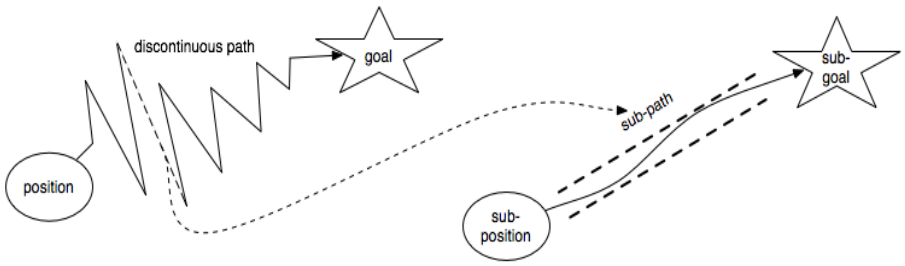
Figure 1 Left on-demand model to be compared with the novelty model on the right



Growing defines the learning; it can anticipate what is still unknown. Novelty occurs when some internal associations are created or external events happen, which have no relation to prior-experience. We may separate two types of learning processes to increase the learning of novelty: reflection and mastering. Reflection denotes the internal learning taking place in a learning system. Connections are made based on the connections that already exist within the system. It is an internal reconfiguration process and does not necessarily result in a knowledge model that is consistent with the external world. Mastering is learning by doing, the internal reconfiguration will be externally tested. Radical novelties can emerge by rapidly switching between mastering and reflecting with concepts that are not yet fully developed. Switching learning directions is represented as a saw-like line in figure 2. During reflection you start with many experiences and your

goal is to have a good model to represent those experiences. With mastering you start with a model to act on. Your goal is to produce actions that work. However, during the learning path new insights may have occurred, enough to change direction. A small remark, the system doesn't need discreet steps, but continuous measuring ensures regulation when to stay on the path and when to reformulate the whole position-path-goal relation.

Figure 2 The discontinuous and saw-like learning path



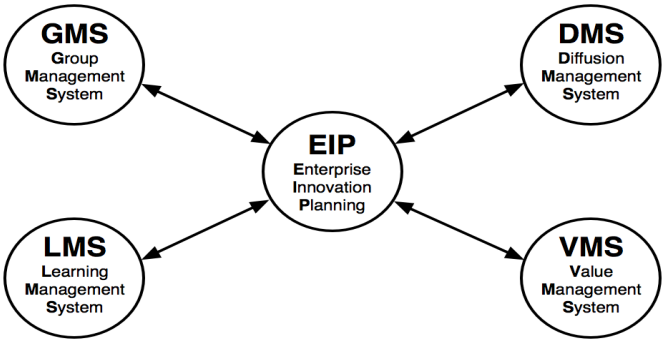
To obtain a better understanding of how actions and knowledge relate and how experiences lead to knowledge, we can look at the knowledge elements of each process. The externalizing process adds tags to the concepts. Tags are placeholders to the observed world, corresponding to what Whitehead (1925, 1967) calls proposition. Tags can sometimes be quite literally labels; sometimes they are merely virtual markers, only visible to the observing system. Internalizing will associate the concepts to other concepts, creating a rich knowledge landscape relevant to the situation the system is in. These tags and associations may result in the recognition of a pattern that has a motivational relation. Without clear motivation the tags and associations are linked by defaults. With a motivation such tags and associations may get a different meaning. For example a cup is by default used to drink, but in many offices they are used to put pencils in. Tags, associations and motivations only exist to the extent that there has been prior experience. Reflection has categorized and abstracted experience to a knowledge model. Experience can be trivial or it can be incomprehensible, in both cases it is discharged. We can however add an external regulator to help. For example, an expert's opinion may illustrate the non-triviality of an experience. For the latter, think of driving a car. The first time too much needs to be learned; the driver has several blind spots for danger and needs a co-driver to guide him through the first attempts. Even very dynamic processes may become trivial. For example, when driving a same route for years the driver starts doing it on "auto-pilot" and can be left with no memory whatsoever of the event.

3 Enterprise Innovation Planning

Open business models are emerging to create and manage the acceleration of innovation. The business models have inspired the management systems of our Enterprise Innovation Planning. Four management systems, and the mediating EIP-system, relate to the NA-processes (figure 3). The Group Management System is to support groups that will investigate a discontinuous innovation. It is the internalizing process of the EIP-system. The externalizing process of the EIP-system produces spin-offs by a Diffusion

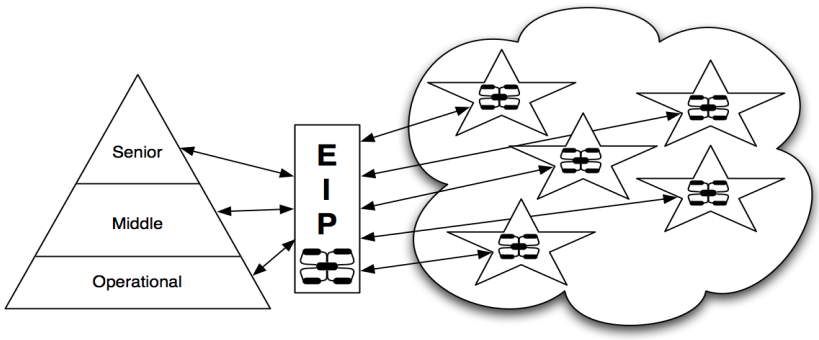
Management System. The ecosystem is an open system; it is not always clear who creates and who owns the advantage. To this end we suggest the "Value Management System", which regulates the assets of the innovation and so is the directional process. The "Learning Management System" is to gain understanding and learn novelty, so it relates to our growing process.

Figure 3 The Enterprise Innovation Planning system



In most innovation management systems, the responsibility of discontinuous innovations is the responsibility of senior management. On the other hand we see incremental innovation being pushed at the operational level, where good practices emerge in a self-organizing way. The innovation strategies seem to cut out the middle management. Middle management is expected to make the system scalable, but can only be deployed when we understand the problem. With the EIP-system we try to restore the balance. Applegate and co. (2003) already suggested the inclusion of middle management by way of a Big-Small Business design. The design is a hybrid of an enterprise and an entrepreneurial system. They suggest that middle management is responsible for the learning process. This relates well to our NA-model. For our learning processes, reflection is similar to SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis and mastering is similar to action-planning. So we expect middle management to regulate the SWOT-analysis and the action-planning. Most businesses start with a good SWOT-analysis and then deploy the business as the action-plan. As illustrated in figure 2, we expect a more interactive relation between analysis and actions. In many innovation cases we do see some small iteration. Sadly, it is too often seen as a necessity for take-off, but rarely the general business strategy. At the start of previous section we expressed novelty as a concern for individual and organizational learning. This has been observed by others (Levinthal and March 1993, Mahoney and Pandian 1992). In relation, we see two types of NA-models (figure 4). The EIP-system deals with new organization by building groups. Each group has an NA-model to deal with new expertise. The double NA-model has relevance to shaping and regulating the novelty. New groups can provide leverage or breakdown to insights and new insights can do the same to groups.

Figure 4 EIP regulates novel groups (stars). Each group regulates novel knowledge.



Each group can exist out of people from any place in the enterprise. It really depends on the specific context, not on the system. When learning fits well with the business strategy, it would be dominated with operational management. In the other case, when too much is unknown, we can disrupt the business and senior management will be needed. However, both are exceptional cases, even for discontinuous innovation, we expect middle management to regulate most of the learning. The problem is to open up for possibilities. As expressed earlier, constraints are needed for thinking outside the box. The real question is how to build capabilities so it will improve the competitive advantage. Teace, Pisano and Shuen (1997) suggest the dynamic capabilities framework existing out of positions, processes and paths. Quite similarly, Christensen (1997) suggests the organizational capabilities framework existing out of resources, processes and values. What we suggest are very different capabilities. These capabilities are needed to understand the competitive advantage locked up in the operational complex (figure 1). Accordingly we like to call table 1 the complexity capabilities framework. We shall give more information for each management system.

Table 1 Relation between the management systems and the NA-model

Processes	*Actors*	*Business*	*Assets*	*Knowledge*	*Organization*
Internalizing	Resources	Strength	Property	Associations	Actors
Externalizing	Public sphere	Market	Brand	Tags	Business
Directing	Allies	Opportunity	Network	Motivations	Assets
Growing	Peers	Acquisition	Culture	Experiences	Knowledge
Mediating	Group-MS	Diffusion-MS	Value-MS	Learning-MS	EIP-system

Group Management System

The Group-MS is expected to create, reinforce or reconfigure projects or groups. Cross-fertilization between groups and merging or reorganizing of groups should be very common when dealing with novelty. Events as conference, brainstorming sessions and online-community support are vital tools. Self-organization is an important issue in Group-MS. Open-space (Harrison Owen 2008) events or so-called un-conferences allow maximum self-organization by the attendees. The self-organization can partly shift to a pre-event organization by using wiki's or other collaborative website tools. This helps

organizations without limiting the brainstorming effect of the event itself. Groups exist of actors. Latour (1999, pp 98-108) has identified the actors, which are seen as the needed capabilities to account for when dealing with extracting novelties from the operational complex. Resources are needed to mobilize the world, but undergo the pressure of approval of the public sphere. Examples of skepticism from the public would be innovations on cloning and nuclear energy. In contrast, the public approves of Internet and green technology. For entrepreneurship, the concrete development will depend on the alliances that can be made. Peers (colleagues and competitors) are needed to verify, continue, improve or expand the work. SWOT-analyses need to identify the actors and their influence of the undertaking, this way weak or strong links can be discovered. With these analyses, actions can be taken to strengthen weak links or play out strong ones.

Diffusion Management System

Diffusion happens by creating spin-offs. Our understanding here is mostly based on entrepreneurial universities (Branscomb, Kodama, Florida, 1999), like diffusion & valorization cells and venture capital. Many ways exist for a business to get data and plan a spin-off. The data is very regionally dependent and very specific for each type of business. Again events are very important, but now it is not related to self-organization, but to exposing the model. Exposing the business can be supported by social technology with blogs, forums or portal sites. The main focus is to enable the business by communicating and negotiating with possible suppliers, customers, facilitators, etc. The negotiations give feedback? Just like any other management system they provide leveraged or breakdown for each other. We regard strengths and weaknesses as internal capabilities. Opportunities and threats set the direction of the innovation and the market is the external capability. Entrepreneurial organizations grow when they become the dominant design in a new market. Such a venture will deal with its growing problem by acquisition of the competition.

Value Management System

With discontinuous innovation it is important to understand that values may change radically. Several cases exist where the value management went wrong, especially the long-term effect. Like the case of Xerox PARC, where plenty of value was created but little was captured (Chesbrough 2003), or how the value of disruptive technology was misunderstood (Christensen 1997, 2003). Radical changes can also redefine scarcity and abundance. For example, the Internet has made labor work abundant (Friedman 2005) and digitalization has created abundant inventories (Anderson 2006). On the other hand, we are running out of nature and see a green technology dealing with nature as a scarce resource. Such radical changes in values are important to a system that still needs to shape the value and process. The Value-MS will need to be an autonomic entity that has its own right to provide leverage or breakdown to new business developments. It may not dominate the system either. We propose asymmetric strategy alignment. Asymmetric strategy alignment is more than trial-and-error, but it is not an autonomous strategy management either. There should be a natural order between the creating and the undergoing of change. It should ensure sustainable collaboration and build trust between adventuring partners. In our two previous management systems, we have projected the NA-processes to a specific capability. The previous attempts will be helpful to find the

assets for the value-MS. The internal, related to resources and strengths, are properties, which are protected or defined by legal structures. The external asset is given by the public and relates to the market position. It is the brand, which denotes the reputation and quality. Networking is used to create alliances and find direction, while the culture facilitates the growth of companies' assets. Indeed, the Value-MS capabilities are only created by an internal reconfiguration. We expect verification changes to occur when we empirically investigate the Value-MS.

Learning Management System

The Learning-MS is expected to create knowledge. The column in table 1 has already been explained during the outline of the novelty theory. The concepts are basically related to the cognitive learning. With the Learning-MS there is much to say about organizational learning processes. As expressed earlier, radical novelties can emerge by quickly switching between analyzing and acting, even with concepts that are not fully developed. Learning requires methods of feedback to make our efforts fruitful. Agile software development has shown how to manage iterative-development processes. In our theory, we have addressed anticipation control. For learning-MS, we consider SCRUM (DeGrace and Stahl 1990) to be one of the agile management techniques applying anticipation control. We can learn more from the research on rapid, but sustainable, software development. For example, we wonder how to translate the unit-testing technique for our learning-MS. Unit-testing is a way of creating a test for each function one creates. This way a new function can automatically be tested against the existing functions. It would be very useful to have a similar framework of verification for learning. Notice that the agile management comes more from software development literature than from innovation management. It should therefore be no surprise to find more convenient software techniques. The internal-external relation already exists with tagging. Tagging, as constructed by Delicious, is used to link interesting sites with a keyword. Similar keywords form tag-clouds, which are grids of associations. Existing development communities also show some other interesting IT tools, such as the use of issue-queues and backlogs, which make links to motivations and experiences.

Enterprise Innovation Planning

Each of the management systems is already complicated in itself. How they provide leverage or breakdown to each other's processes will make it a truly complex system. The mediating process is a passive one. The added complexity is nothing more and nothing less than the interaction between the anticipating processes. If we looked at the overall behavior of the EIP-system, it would appear to be out of control. Then when you regard each sub-system, it seems they are not explaining the overall complex behavior. Indeed, the structure of the NA-model adds an emerging control – one that is not present in any of the components – it forms a complex self-organizing system. The system is not really controlling complexity, it is coping with complexity by agilely adapting to perturbations. The four management processes simultaneously shape groups, businesses, values and expertises. The actual outcome is uncertain, but each management system will ensure having their constraints met. During the processing, knowledge will create boundaries and make an artificial setting that is less complex and can be controlled by

quite specific knowledge (explicit and implicit), resulting in specific operational processes and a simple anticipation control as in the left of figure 1.

4 Supporting EIP by Social Software

Social software is software that triggers the social reflexes of the user. Examples are social tagging, social networking systems, forums, wiki's or content management systems. Best practices of the different types of social tools illustrate that the tool is specific to the social reflex (Coenen 2006, 2009). For example blogs are good for storytelling, where forums are better to ask questions and a wiki is most useful for collaborative publishing. In some cases a critical mass will result in making the system more sustainable. Good examples are Wikipedia and Facebook. Social software is as much a technical as a social challenge. For example, the success of Wikipedia makes it a target for information manipulation. As a result it requires supervision to ensure the level of quality and objectivity of the content. Some social software doesn't require face-to-face events, like Wikipedia. It is opposite to the open space-wiki we have introduced earlier. Such a wiki only exists for the face-to-face event. Wikipedia and the open-space-wiki are opposite ends of the spectrum. In between we see the social software co-evolution with face-to-face events. It all depends on the need the social software is supporting.

We look at social software to harvest experience and opportunities in a situated setting, while using the NA-model to reduce the resisting effect. The resisting effect can be overcome face-to-face when people open their minds. In face-to-face communication people can use the full richness of human communication (Daft and Lengel, 1986). This is beneficial to the collaborative creativity process, in which new ideas are floated, criticized and fine-tuned rapidly. It is not always practical or possible to organize work when participants are living in different geographical locations or have different agendas to account for. The web as an asynchronous communication medium keeps the work practical. The face-to-face communication may also be disturbing once the analytical phase is over and planning is needed. Related to our NA-processes, face-to-face communication is good for mediating, but asynchronous communication is good for the growing process. The mediating process becomes weaker as the growing process becomes stronger. This will increase the resisting effect of experience. Alternating seems an important method, like the two learning processes, we now observe the need to alternate between face-to-face and asynchronous communication too.

The resisting effect can also occur in face-to-face events and many creative processes have been invented to reduce the resisting effect. A trend is to restrict the people in their abilities to stimulate creativity and problem solving. Our goal is to do something quite similar: restrict the user to ensure that the correct processes are present. Indeed, the complexity capabilities framework (table 1) is seen as the constraints to be creative with. The proposed social software system will be a shell around the capabilities framework. We have already made some links between the social software and each management system. Only with the learning-MS was the software very close to the capabilities in the table. It is clear that we are only at the beginning of our investigation. We need to figure out how the user will want to work with the system. For example, we have identified that alternation is needed. Depending on the state only certain actions are desired. Can we

force such restrictions onto the user? We are convinced that the development of the appropriate software will need to take place by involving the users. So we are using the action research methodology again. There will need to be a competitive advantage to use the EIP software. It is our goal to have the novelty theory running in the back. The software is expected to create visibilities and suggestions based on the concrete date by the users and regulation by the theory.

5 Conclusions

The paper relates to the problem of managing discontinuous innovation. We propose a novelty theory based on interdisciplinary research. The theory has its background in cognition and can be useful to improve our understanding of discontinuous innovation. It is impossible to know exactly what kind of discontinuous innovation will occur. What we can do, based on the NA-model (figure 1), is understand the context and the conditions of discontinuous innovation. It has already been accepted that incremental iterative development processes are necessary for discontinuous innovation. According to the novelty theory, iterations should be alternated between SWOT-analyzing (reflection) and action-planning (mastering). The alternating-iteration (figure 2) can work without complete understanding to build radical novelties. We recognize two types of NA-models. The EIP-system is a NA-model to create new groups (figure 3), while each group has a NA-model for new expertise (figure 4). This relates tot our complexity capabilities framework (table 1). Several capabilities frameworks are suggested in innovation management, we try adding a level of detail in our attempt towards the operational complex.

The research, on building an EIP-system via social software to facilitate the discontinuous innovation management, has just started. Theory was needed as a kind of analysis, now we need empirical experiments to build the software, which is a type of action-planning. Indeed, the EIP-system is itself a novelty and has to be created accordantly. We are using a controversial method of bootstrapping to justify our approach. Bootstrapping is a very special control system, where A creates B and B creates A. It is out of the scope of this paper to explain bootstrapping, accordingly we have not touched upon the subject, but it is our method of investigation. We expect many changes to both theory and practice before the model will be appropriate. The general line should be most stable, but details will definitely change. This is the way novelty is learned: from general abstracts to concrete situations (and vice versa). For our current research we are doing AS-IS analysis and gap analysis with partner in the field. This is needed for the empirical research on EIP software.

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