THE AGILE-ENTERPRISE INNOVATION PLANNING: HOW TO ALIGN SELF-ORGANIZATION PROCESSES FOR INNOVATION MANAGEMENT.

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Abstract: The Agile-Enterprise Innovation Planning System (A-EIP) is build to manage breakthrough innovation based on best practices in the innovation literature. From the literature a novelty paradox is recognized: knowledge is both a barrier as a source for innovation. The goal of the A-EIP system is suppress the former and amplify the later. Theory on self-organizing feedback mechanism are needed to understand how to overcome the novelty paradox. The A-EIP system contains four management systems (MS): Group-MS, Business-MS, Strategic-MS, Learning-MS. Each management system will be important for the basic three stages of innovation: incubation phase, growth phase and maturity phase. The management systems will create a flow over the three phases and make emergence and aggregation manageable. The practical development and validation of the research is done in respect to Internet innovation. In contrast to innovation cases, a new emerging approach is pursued. Currently experiments have been done with a course that can be extended to a full Master program to create micro-spinoffs, such a program is considered the easiest way to create a test bed for the A-EIP system.

1 INTRODUCTION

History has the habit to repeat itself. This is why the Agile-Enterprise Innovation Planning (A-EIP) system is named after the Enterprise Resource Planning (ERP) system. Before the ERP system existed, only the super-accountants of a company had a holistic view of the company's resources. Now, more people may acquire a strategic understanding of the resources via an ERP system. Today, we see visionary leaders who facilitate innovation in a similar position as super-accountants before ERP.

The problem with not having a way to understand how some CEO create value from innovation is that it results quickly in personal cult and celebrity status, which are not a guaranty for success. What is more, celebrities make market very nervous. Probably the best example of this is how Steve Jobs health has a direct influence on the stock of Apple. Notice that ERP systems did not replace super-accountants but made the system more accountable. In this way the ERP systems made the market less autocratic and more democratic. We need a similar democratization movement for innovation management.

Using IT-support for resources is simple compared to support for innovation. It is not impossible to build support for innovation, but it requires a profound understanding of innovation management and understanding of complicated feedback mechanisms. In previous research a theory, based on system and cybernetics research, has been developed to explain a complicated feedback mechanism that overcomes the novelty paradox (Kiemen 2008). According to the novelty paradox knowledge is both a barrier as a source for novelties.

The novelty theory will be used in this paper for defining the main structure of the A-EIP system. To avoid the novelty paradox, the A-EIP will create tools to support the innovation. The tools are designed to rewire knowledge, by disconnecting it from its historical context and connecting it onto the emerging novelty.

The A-EIP contains four interacting Management Systems (MS): Group-MS, Business-

MS, Strategic-MS, Learning-MS. The Group-MS is needed to support small agile teams that will explore an idea. The Business-MS is needed to transform the idea into a spinoff. The Strategic-MS is needed to get a holistic view about the innovation strategy. The Learning-MS is needed to create learning processes for all the emerging novelties.

The A-EIP system is considered an IT support for next generation Technology Transfer Office (TTO). According to Koenraad (2010) a next generation TTO would be fully imbedded in the university functioning. Early experiments have been done with a course. The course could get extended to a program to pursue micro-spinoff opportunities. By creating such a program the required condition to validate the A-EIP system can be possible.

2 DESIGN OF INNOVATION

The innovation management literature can be organized according to their conceptual design trend. The most important conceptual design for breakthrough innovation is rooted with Schumpeter's (1975) creative destruction. Schumpeter noticed how the market had competition from within: new players were capable of overthrowing incumbents. It seems to be particularly the knowledge barriers that requires breakthrough innovation management. By identifying a simple and a breakthrough problem, scholars have identified different barriers: component and architectural (Henderson and Clark 1990), continuous and discontinuous (Hamel and Prahalad 1994), incremental and radical (Freeman and Soete 1997) and sustaining and disruptive (Christensen 1995).

Another conceptual design has its origin in Porter's (1980) competitive advantage. This design focused on identifying the strategic business value. It was further developed as to the resource-based view (Wernerfelt 1984; Barney 1991) and then shifted to the dynamic capabilities framework (Teece, Piasno and Shuen 1997; Eisenhardt and Martin 2000). A third, more fragmented conceptual design, is based on alliances. Some related theories, amongst others, are absorptive capacities (Cohen and Levinthal 1990), ambidextrous organizations (Thusman 1996) and open innovation (Chesbrough 2003).

The creation of value from breakthrough innovation is an ad-hoc activity. Organizing these activities in an existing business will create a knowledge barrier. The breakthrough innovation has to emerge openly as a whole complex and it should only be reintegrated into existing business when it becomes stable.

The goal to create an IT-support structure inline with such a view is not new, but the issue has been scarcely mentioned. Applegate and Co. (2003, p 232) intruded a big-small design in their 6th edition of their book. The design is proposed as a hybrid between a big company and a small agile company as to overcome the novelty paradox. Although the 7th edition builds on the previous big-small design, it is now called an agile enterprise with an on demand control (Applegate and Co. 2006, p 58-71), but by adding the detail the general big-small design gets lost.

Christensen's elaborated studies on disruptive innovation come very close to the core of the novelty paradox. Christensen (1997, p 96-97) illustrates why management cannot understand breakthrough innovation: they have no values for measuring emergence and aggregation. Christensen (2003, p 237-242) also illustrate how not being able to value such innovation leads to the downfall of the company on longer term. He even suggests a disruptive growth engine (ibid, p 278), but more as formal business processes than as an IT-system. Clearly our A-EIP system will be closely related to the disruptive growth engine.

3 THE NOVELTY MODEL

In cognitive studies of the mind, much effort has gone to understand the information processes for learning. The basic mechanism is feedback, but in some case feedback is not an option, because the feedback would be too late. One extreme example is to test if one more step would make you fall from a cliff. In many ways a feed-forward process is more interesting, but feed-forward is only possible if a good internal model exist to make the prediction. In a complex dynamic environment the feed-forward would not be a good option too.

A compromise is created, a feed-forward process that is corrected by a feedback process, which we call an anticipation process. Hawkins (2004) predicts that we should find anticipatory cells in all areas of cortex. With such anticipatory cells Hawkins create convincing hierarchical structure for our sensory system as a micro-management of anticipation. Simon (1962) defines such a structure as a hierarchical architecture of structural complexity. Dehaene et al. (1998) uses four such hierarchical structures as entries to the global workspace of the brain. Little did they know that they just discovered

the novelty model. Kiemen (2008) claims that such a novelty model has been constructed in three in depended analyses.

The four anticipation processes lift the novelty paradox by creating a complicated bootstrapping relationship. Two "things" A and B can be said to stand in a bootstrapping relationship if A is used to develop, support or improve B, while B is used to develop, support or improve A. The internalizing and externalizing process build up a knowledge model inline with what is in the environment. The third anticipation process, called directing, will add focus to amplify rear events. With three processes the system has novelty, but does not understand it yet. The last process is the actual learning process that anticipates what is relevant in the rear events.
The four anticipation processes, internalizing, externalizing, directing and learning, are connected to a working memory that functions like a blackboard. If one process adds a concept the other three will react on it, which can strengthen the concept, break it down or create alternatives. This quite complex interaction can, under good conditions, solve the novelty paradox. Although the novelty model is mostly based on cognitive studies, another novelty model was found by studying how science emerges (Latour 1999, see Kiemen 2008).

4 A-EIP SYSTEM

Kiemen (2009) designed a novelty model for innovation management, which turns out to be a hyper-novelty model. A hyper-novelty model is a model where each of the four hierarchical structures is itself a novelty model. One interpretation of this effect is that innovation is the novelty of novelties.

The four hierarchical structures of the innovation model are Management System (MS) of A-EIP: Group-MS, Business-MS, Strategic-MS, and Learning-MS. Each MS relates to one of the four anticipation processes, but each MS is also a novelty model. The Group-MS will internalize the innovation, as the group becomes a new actor to explore the innovation. The Business-MS will externalize the innovation by creating a spinoff. Between creating a group and having a spinoff we have the innovation project. The Strategic-MS will give direction by identifying values that emerge when the project grows. The Learning-MS will create knowledge about how the project can grow.

As each of the four management systems is a novelty model, they all have anticipation processes, which get named after their key indicators. The subsections describe how these 16 indicators determine the core functionalities of the four MS's. However as this is a hyper-novelty model the MS are part of a meta-level model, which also adds four key indicators. So in total 20 key indicators are recognized, as illustrated by table 1 in the appendix.

The goal of the A-EIP system is to have a general IT-support for all activities of the innovation project and to design the coordination between activities so that they suppress knowledge as barrier and amplify knowledge as source for innovation. It is claimed that the table enforced such a rewiring of knowledge.

4.0 The core of A-EIP

The core of the A-EIP is a project management system. The project core is needed to communicate issues and plan event. The key of any innovation is to take actions as to transform an idea into a reality. Of course the problem of such a system would be the novelty paradox, but this is why the core interacts with the Group-MS, Business-MS, Strategic-MS, and Learning-MS.

Managing agile project is a topic well discussed in literature around IT management. Such knowhow has to be applied to the project management, like scrum methodology and group decision support. What is different is that the interaction via the four management systems should create a cognitive landscape in relation to the novelty model. Innovation is often represented as three phases of an S-curve, which will have their effect on four management systems. The three phases of an S-curve are: the incubation phase, the growth phase and the maturity phase.

Each user should know in what phase the development is as to understand the difference in the game. In the incubation phase many things are unknown and uncertain. In this phase variety and collaboration is needed to explore the novelty. To manage all the disconnected parts an issue queue like structure is needed. Such a structure contains meta-information or tags, which is abstract and allows bundling associations between the disconnected parts.

During the growth phase a selection will occur by merging projects. Now it will be relevant to see friendly competition to make the fittest projects absorb other project and thus include their assets. In the maturity phase the assets are known. Business processes and a knowledge system allow the project to get continued by other people than the creative teams.

4.1 Group Management System

Innovative groups are agile groups they have a core of people and an extended social network to allow the group to explore the innovation. In the incubation phase there may be several subjective reasons for the team to form. The teams would be small and one member would be in several groups.

A group would contain fulltime equivalent (FTE) between 1 to 7 people. The number is not absolute, it depends on the complexity of the problems. In the incubation phase groups are unstable and can easy change. During the growing phase the groups are stable and should grow. Depending on the complexity of the project the group is expected to grow to 25 to 75 FTE. This can happen by merging of project.

The Group-MS contains elements that allow a project to take action. As such Group-MS makes an actor emerge. From the model of emerging science (Latour 1999), four types of actors are identified: resources, audiences, allies and peers. Resources (e.g. time, money, human resources, etc.) can help to make the group act. Audiences can make sure that the actions of the groups stay relevant. By finding allies the resources and audiences can become bundled, this will create leverage. The sustainability and growth of the group will depend on the available peers. Peers are colleagues in the incubation phase, competitors in the growth phase and external expert in the maturity phase. While allies have complementary goals and assets, peers have the same goals and assets.

The Group-MS can be best compared as the merging of a social networking site with a Human Resource (HR) system. The social networking will contain extended profiles to formalize and document the different actors, which allow the emerging of social interaction, like knowledge sharing and idea generation. Not every person will want to be part of every phase in the project as such the HR part of the system should simplify transition between groups.

4.2 Business Management System

Just as the Group-MS has its effect on each of the three phases, so will the Business-MS. This is evident for the maturity phase, but does require explanation for the incubation phase. Spread over the many innovation management cases, one can recognize the importance of feedback form early business development. It allows the identification of emerging markets; elaborate the change needed in supply and defines the business culture.

Many new businesses use Strengths, Weaknesses, Opportunities and Threats (SWOT) analyses to explore business opportunities. In relation to the novelty model, the first two aspects (SW) are considered internal features, while the last two (OT) are considered directional features. The external and learning features are related to action planning, which follows the SWOT analysis. The external feature is the action planning that will test how to serve a market. The action planning will result in business process to regulate the operations, which is considered the learning features. By creating more agile iterations of SWOT analysis and action planning it is expected to improve the business development during each phase.

During the incubation phase the iterations will need to be short, just a few days, and plenty. The goal is to increase diversity and find unlikely business opportunities. During the growth phase the iterations can take weeks, but only few iterations are created, now the focus is to find advantages over the competing projects. For the maturity phase there would hardly be more than one iteration, but it could take months, now it is directed to possible acquisitions or spinoff.

The IT-support for the Business-MS will become the intranet knowledge base. For the A-EIP the intranet is the externalizing of innovation, as it allow to spinoff the novelty to better know expert methods, which only work if there is knowledge. While the variation in the incubation phase would have created disconnected bits of assets, the growth phase would result in standardization of that knowledge and the maturity phase would align the standard with particular markets or firm.

4.3 Strategic Management System

Strategy is normally focused on the core business of a company. However innovation often redefines strategy and so strategy will need to be discovered too. Xerox PARC is a classic example. While Xerox PARC has invented many technologies, it often failed to create value, so an open strategy is needed (Chesbrough 2003).

From the analysis about innovation strategy (see section 2) four key indicators are suggested: bundles, brands, networks and cultures. The bundles refer to how the aggregation of business assets, like resources, result in unique values that need to fit a particular business strategy. For brands, we can look at case of near bankruptcy. In such cases companies get divided, but this was not the case for Apple or IBM. So the brand has its influence on the strategy.

Imagining an idea is easy, but putting it in practice will depend on networks. An idea can become unrealistic because no network can be created. The strategy will as such adapt depending on the actual network that is being build. Then there is the business culture that facilitates the growth of companies' assets without the need to organizational control. So culture automates the emergence of business values.

Related to the novelty model, the bundles are internal features, the brands are external features, the networks are directional features and the cultures are learning features. Together each feature makes a holistic view of all the values emerge. Mapping and modelling tools can give IT-support to make the holistic view emerge for the Strategy-MS.

The Strategy-MS values would also be disconnected bits during the incubation phase. In the growth phase, strategies are aligned and the values they envision will regulate the activities in the Group-MS and Business-MS. During the maturity phase the Strategy-MS has to regulate the overshooting effect.

Overshooting often happens by focusing on a minority of high demanding customers. Such customers will have demands that are totally irrelevant for the minority of customers. If a company asks the majority of its customers to pay for a service that only a minority requires, the company is creating an opening for low-end competition. Instead we expect the overshooting to identify innovation opportunities for new projects.

4.4 Learning Management System

Learning is so important for breakthrough innovation that it requires a separate management system. Learning is indeed about knowledge, but the goal of the Learning-MS is not the intranet of the Business-MS. The goal is to understand how to learn related to the innovation. After all, once a breakthrough innovation is understood there will be incremental growth. In educational environments a course is defined to teach the students particular skills. The Learning-MS is to identify the learning skills, and create learning material, processes and validation methods.

Leaning is essential to get trough the incubation phase and the four key indicators are related to it: associations, tags, challenges and experiences. Associations are used to relate existing disconnected issues in any of the management systems. As associations connected fragmented information they internalize a cognitive landscape. The tags identify external information related to any internal issue. As such tags externalize the cognitive landscape and makes in embedded in the environment. The challenges are meta-information, recognized between associations and tags. Challenges will give direction to all the different issues and result in alignment. Challenges will define goals that allow directing the system to amplify the novelty. The experiences are concrete cases that are identified as containing value to be learned. Such value can be both positive, which contain experience in favour to be repeated, and negative, which contain experience best to be avoided.

During the incubation phase the IT-support looks like a blackboard, which has the ability to connect all the disconnected bits of the other management systems. During the growth phase the alignment will result in a repository containing training syllabus and tutorials to train people the required skills. During the maturity phase the Learning-MS can identify spillover effects that would create new opportunities and so new groups to explore them. Such spillover effects would again be disconnected and they would be the first entries to the blackboard. Such spillover effects are expected to stimulate basic group creation.

4.5 Emerging and aggregating novelty

Christensen (2003) illustrate why management cannot understand the incubation phase. Basically it is because they do not have measurable values for emergence and aggregation. By the four management systems such values can become measurable without constraining the innovation, but by understanding the connectivity between the information.

The transformation of each phase is hidden in the control of the different management systems. Once a strategy is clear enough the incubation phase ends and the growth phase begins. Once the intranet can unequivocally state the business values the growth phase ended and the maturity phase begins. During the maturity phase the spillover effects can start new projects creating a recursion in the A-EIP system.

The Group-MS has social networking features that can facilitate the incubation phase. So the Group-MS will dominate the incubation phase. During the growing phase the Strategy-MS will dominate and it will regulate the Group-MS and Business-MS. The Business-MS will dominate the maturity phase. The intranet is expected to grow much more by including the outcomes of the Strategy-MS and Learning-MS.

The other systems still have their effect on the maturity phase, but not on the knowledge base of the intranet. The Group-MS will be most concerned about transferring knowledge to the new team. The Strategy-MS will identify the overshooting effects and the Learning-MS will identify spillover effects, both are used to kickstart new projects. Of course we expect new projects to emerge also spontaneously.

The Learning-MS is the drive behind the phases and the glue between the management systems. While one system is more dominating at a particular phase, they all have their influence and the Learning-MS can help at every step. The Group-MS transition during the maturity phase will make the creative team external expert and allow an operational team to take over, but this is only possible because the Learning-MS has created training packages to do so. The Business-MS is less clear during the incubation phase, but tags can guide the early development. The Strategy-MS can only give a holistic view because of association and it can only have direction because of challenges.

5 CONCLUSIONS

This paper has been examining the A-EIP system and its four management systems to support the development of breakthrough innovations. While the system is complicated, it does seem to give a reasonable answer to innovation management problems. The A-EIP system is both a tool to support innovation as a way to make emergence and aggregation measurable values. The different management systems have a natural interaction that allows a fluid transformation of each innovation phase.

The A-EIP system is however just a design. At the moment the system is only described on an abstract level, but even on that level it has complex structure. Attempt to use the A-EIP system for existing innovation mediums all failed for their own reason and because the large amount of creative people needed for a test (probably more than 200). Consider the way the A-EIP system is designed; *it is itself a breakthrough innovation*. Thus it needs to follow the breakthrough innovation method. Let us consider the four steps in Christensen's (2003, p 278) Disruptive Growth Engine:

1. Start before you need to
2. A senior management in charge
3. An expert team of movers and shapers
4. Train the troops

Notice that step 3 is part of the incubation phase and step 4 is part of the maturity phase in the A-EIP system. It is expected that first steps 1 & 2 have to be taken before it is possible to develop the A-EIP system itself. Kiemen (2010) has created controlled tests with course over a period of four year to address step 1. In that course business students learn about future Internet development by developing their own projects. This controlled environment only allows for understand how to approach step 2.

Step 2 seems to be a tricky issue. Christensen considers that the breakthrough innovation emerges in a large company. As step 1 has emerged in academic environment, it may well be needed to have step 2 also in the same environment. Instead of senior management a Dean or even a vice-rectors may be needed and a bigger research/education project to investigate the next generation of Technology Transfer Office (TTO). Koenraad (2010) elaborate the evolution if TTO in three stages:

1. It started as an isolated operation next to the university
2. It became a professional service supporting the third mission activities of the university
3. It is emerging towards a strategically embedded and fully diffused activity throughout the university

Koenraad's 3rd stage seems a natural extension to the controlled experiments with the course. The outputs of the current course are IT prototypes for an Internet business. So far one student has created a business plan to take the prototype to a next level. If the course could be extended to full Master program on Internet Business, it would allow the further support of micro-spinoffs. The micro-spinoffs would not be a disruption of regular academic spinoffs as PhD spinoffs are breakthrough projects. Instead the support for micro-spinoffs can be a test bed for the A-EIP support, which could later become valuable to support PhD spinoffs.

To finish this paper, we like to notice that the whole A-EIP system is being tested for Internet application, as the Internet makes many parts emerge fluently. This is not to say that the A-EIP system is only usable for Internet, but it allows us to understand the basic functioning. Once the A-EIP system has a proof of concept for Internet innovations, studies can look at how to use the A-EIP for other domains.

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APPENDIX

Table 1**:** The A-EIP system and its 20 key indicators.

General terms	*Group-MS*	*Business-MS*	*Strategic-MS*	*Learning-MS*	*A-EIP system*
Internalizing	(1)Resources	(5)Strength	(9)Bundles	(13)Associations	(17)Actors
Externalizing	(2)Audiences	(6)Market	(10)Brands	(14)Tags	(18)Spinoffs
Directing	(3)Allies	(7)Opportunity	(11)Networks	15)Challenges	(19)Values
Learning	(4)Peers	(8)Processes	(12)Cultures	(16)Experiences	(20)Knowledge
Novelty	*Actors*	*Spinoffs*	*Values*	*Knowledge*	*Innovation*