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NATIONAL OPEN INNOVATION SYSTEM (NOIS): DEFINING A SOLID REWARD MODEL FOR NOIS

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Abstract: With the aim of generating new ideas, a novel Online Social Network (OSN) based National Open Innovation System (NOIS) is introduced. Although the motivations to participate in online communities have been studied a lot, impacts of rewards on the open innovation activities such as NOIS have not gain much interest. To create successful innovation system, it must include options for rewards for all key actors. We will define generic success measures for NOIS reward model and introduce the body of knowledge regarding rewards in general and in online communities. To summarize our findings, we will suggest a solid reward model for Open Innovation based OSNs and NOIS.

Keywords: Open innovation; National Innovation System; Foresight, Customer orientation; Rewarding; Incentives, Triple Helix

1 Introduction

Since 1980s the most competitive countries in the world typically have sophisticated National Innovation Systems (later NISs) (e.g. Lundvall, 2007). However, there are only a handful of attempts trying to combine the open innovation approach to NISs (Santonen et. al 2007), although open innovations are argued to significantly increase the effectiveness of innovation processes. Open innovation term describes open way of innovating in which internal and external ideas and resources are combined on the way to

introduce new products and services (Chesbrough, 2003). Moreover, online social networks (later OSNs) – communities and hosted services facilitating collaboration and sharing between users (Cachia et. al. 2007) – have recently gained a significant interest. We believe that OSNs can be utilised as a critical part of NISs by defining Open Innovation based National Innovation System i.e. National Open Innovation Systems (later NOIS) (Santonen et. al 2007). To create successful innovation system, it must include options for rewards for all key actors. From this perspective it is important to consider what kind of reward model would mostly benefit each stakeholders in the case of NOIS. It is argued that by defining a solid reward model, we can significantly increase the likely hood of NOIS success. In spite of these facts, especially impacts of rewards on the open innovation activity have not gain much interest. Since human beings are purposeful creatures, a study relating rewarding in NOIS context is central both in terms of individual decision-making and co-operation.

Firstly we will introduce the main principles and key players of NOIS concept. Then we continue by defining the generic success measures for NOIS reward model. Thirdly, we will introduce the rewarding structures in general and especially in the case of online communities. Finally we will suggest a solid reward model for NOIS.

2 What is National Open Innovation System (NOIS)?

Figure 1 presents the general Innovation Triangle framework which consolidates NOIS (Santonen et. al 2007).

Figure 1 The Innovation Triangle
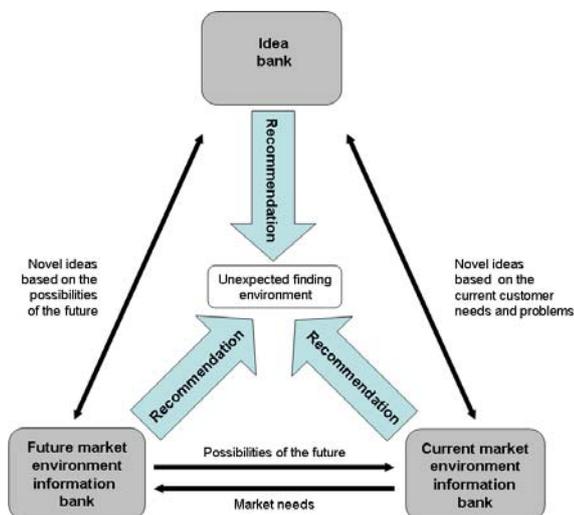
With the aim of generating new ideas (i.e. the top box) NOIS framework includes two complementary innovation sources: first, future market environment information, presenting visions of the future (i.e. the left box) and second, current market environment information, presenting today's challenges (i.e. the right box). By integrating content

recommendation tools with NOIS (i.e. the arrows in the middle), we increase the dynamics of the individual's creativity and create an online environment where conventional habits are easily exceeded. Combined, the approaches of collaborative content production and intelligent content recommendation will significantly boost the possibilities of unexpected findings, which have been identified as a major innovation source.
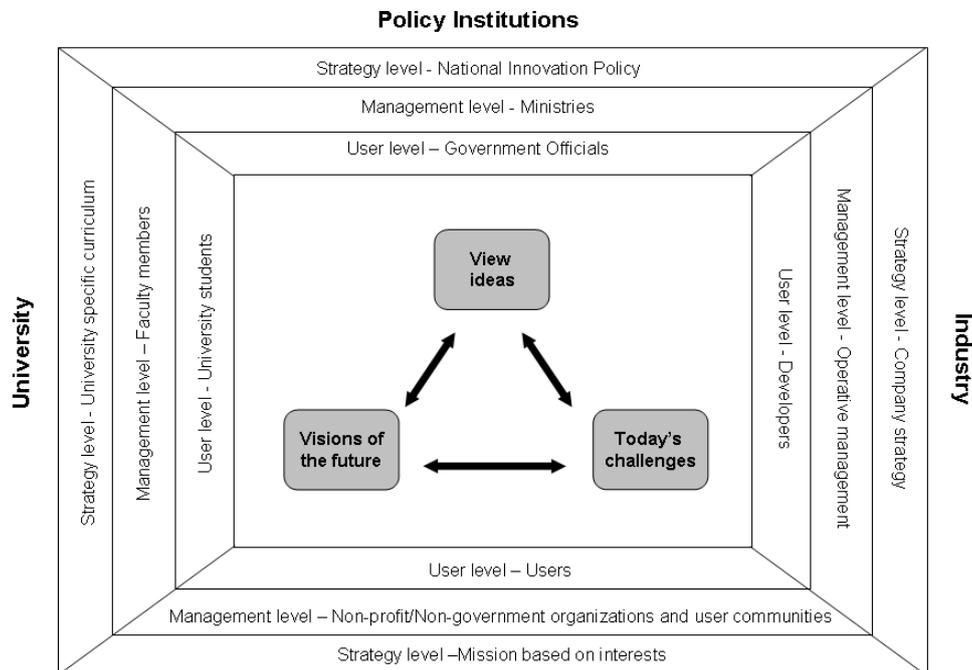
In order to integrate the national innovation policy in to NOIS model and create the solid interaction interface between the three defined banks, the common content classification schema based on industry – innovation field matrix is defined. In principal the industry dimension could be based on any suitable practical oriented industry classification, while the innovation type dimension can be grounded on the innovation classifications defined in the academic literature. These two dimension act as a rough navigation tool for users. However, the key point to support even multiple national innovation policies at the same NOIS are the national innovation policy specific keywords. In addition to generic two-dimensional industry – innovation type classification, all produced content will include a set of keywords. Interestingly a part of these keywords can be derived from national innovation policy structure. Now by using keyword specific searches, one can indentify all the contents and users, which are related to a certain innovation policy. This classification and keyword structure will deepen our understating on the produced content profile while allocating the thousands worker resource efficiently. The more detailed NOIS concept description is defined by Santonen et. al. 2007.

2.1. Identifying key actors in NOIS

In order to identify the key actors in NOIS, we ground our suggestions to the enhanced Triple Helix – model. The Triple Helix is the most well-know framework to describe the collaboration between Universities and other actors supporting innovation processes (Etzkowitz and Laydesdorff, 1999, 2000). In the Triple Helix model each actor has its own task: universities produce research, industries manufactures, and the government secures certain stability for maintaining exchange and interaction. The Triple Helix regime operates on these complex dynamics of innovation as a recursive overlay of interactions and negotiations among the three institutional spheres. The different partners engage in collaborations and competitions as they calibrate their strategic direction and niche positions.

However, in our opinion Triple Helix is lacking a strong desire to identify customer needs and the ability to answer these recognized needs i.e. a true market/customer orientation (Kohli and Jaworski, 1990). Critical thinkers might say that the voice of user or consumer is totally missing in Triple Helix. On the contrary OSNs are grounded on strong user interaction. Therefore, in the case of NOIS which is open innovation based OSN, we need a updated framework, which includes also the users point of view. In Figure 2 we have presented our own enhanced model, which identifies key actors in NOIS.

Figure 2 Key actors in NOIS

Policy Institutions

Strategy level - National Innovation Policy

Management level - Ministries

User level – Government Officials

University

Strategy level - University specific curriculum

Management level – Faculty members

User level - University students

View ideas

Visions of the future

Today's challenges

User level - Developers

Management level - Operative management

Strategy level - Company strategy

Industry

User level – Users

Management level – Non-profit/Non-government organizations and user communities

Strategy level –Mission based on interests

Users and end-customers

On the top of indentifying key actors (university-industry-policy institutions-users), our framework includes following three unit of analysis levels: strategy, management and users.

University. In the case of university actor, we can identify two main user groups: 1) students in the user level and 2) faculty members in the management level. A significant share of the content for the NOIS will be produced by thousands of students performing their bachelor's and master's degrees in the universities. The supervision and management of the student work will be integrated as a part of everyday teaching tasks of the faculty members, while the strategic overall resource allocation will be conducted with the help of university specific curriculums.

Policy institution. The national innovation policy is giving a clear guideline, where the particular nation is heading for. Typically this policy is managed throughout several ministries such as the Ministry of education and Ministry of Employment and the Economy. Finally, the government officials in each ministry are implementing these policies. Therefore, NOIS must be officially accepted as a parallel tool to traditional National Innovation System among policy institution.

Industry. The main customer for NOIS concept itself is the industry. Industry will have an access not only to the extensive idea bank, but also to the visions of the future and today's challenges banks, which are systematically updated and multi industrial. In order to commit company to participate in NOIS, it must include open innovation as a part of their strategy. Management has to implement and operationalize this strategy to everyday life of their business units. Finally, since the novel ideas are first created in the individual's mind, developers in the companies must accept NOIS as a personal tool for them.

Users and end-customers. From the strategy point of view users and end-customers are the most difficult group to control, since they have at least theoretically a huge freedom of choice. All their actions are lead by mission based interest. These interests can be channelled throughout non-profit organizations and user communities, which we in this case consider as a management level.

Especially in the western countries forecasts relating the amount of available workforce have been in unhealthy trend and in general there is a growing need to activate aged and retired people (Katajisto and Kimari, 2005). This voluntary workforce – senior citizens – will be engaged as content providers alongside with more organized universities student resource. In principal the active members of ageing people will have an access to share and communicate their experiences with the youth. Marketing and resourcing this possibility will be conducted throughout the network of voluntary organizations.

To summit up, we have presented all the key players of the NOIS while integrating the Triple Helix and the social networking ideologies.

3. Defining success measures for NOIS reward model

In our opinion there are simple rules for developing and defining a successful reward model for NOIS. *First*, the reward model should decrease customer defection. *Second*, it should increase customer loyalty. *Thirdly*, one must increase the usage level of the service among those users who are already using the service. *Finally*, the model should attract new users and user groups which otherwise would not be interested in using NOIS. If all of these or some of these goals are achieved, the NOIS reward model can be considered as a success.

3.1 Customer defection

Customer defection, customer exit or switching behaviour can be total or partial (Santonen, 2007). Total defection is usually easy to detect, since consumers end all their affairs and switch all their business to another service provider (e.g. Bolton and Bronkhurst 1995, Boote 1998). Partial defection can be determined as a loss of any portion of a customer's business and it is significantly more difficult to detect than total defection (Reichheld 1996). Partial defection occurs in two ways. Customer can either shift some of their current affairs elsewhere or they can actually buy more, but from another service provider, with the latter being substantially more difficult to discover.

3.2 Service loyalty

Service loyalty in NOIS context is defined as a biased (i.e. non random) behavioural response (i.e. revisit), expressed over time, by some decision-making unit with respect to one service out of a set of services, which is a function of psychological (decision-making and evaluative) processes resulting in brand commitment (Jacoby and Chestnut 1978, Bloemer et al. 1998). Many authors seem to agree that service loyalty is a multi-dimensional construct, yet among the academic community there appears to be disagreement over the number and context of these dimensions.

On the basis of the behavioural intentions scale originally proposed by Zeithaml et al. (1996), Ruyter et al. (1998) argue that there are three dimensions of service loyalty including preference loyalty, price indifference loyalty and dissatisfaction response. However, later on – mostly by the same authors as in Ruyter et al. (1998) and using the same behavioural intentions scale – it has been suggested that there are the following four dimensions of service loyalty (Bloemer et al. 1998): purchase intention, word-of-mouth communication, price sensitivity and complaining behaviour. Zeithaml et al. (1996) themselves also initially proposed this four-dimensional construct, but on the basis of factor analysis they concluded by suggesting a five-dimensional construct including loyalty to company, propensity to switch, willingness to pay more, external and internal response to problem. Interestingly empirical tests with data from nearly 1,700 consumers in Finland supports the original four dimensional approach, although a shade of interference in the unidimensionality of the service loyalty instrument in question was observed (Santonen, 2007). As a result we suggest that in practice most useful and robust service loyalty measurement tool for NOIS appears to be a model, which includes following four dimensions: 1) purchase intention, 2) word-of-mouth communication, 3) price sensitivity and 4) complaining behaviour.

3.3 Service usage

The Technology Acceptance Model (later TAM) has previously been validated as a suitable instrument to measure and evaluate software application usage also in the World Wide Web environment (e.g. Davis 1989, Davis et. al 1989, Moon and Kim 2000). In original TAM theory, the perceived easy of use and usefulness are suggested to affect on the attitude towards using a particular software application. Further on, the attitude towards using application is suggested to affect on end-user's behavioral intention to use the application. Finally, behavioral intention on the other hand is argued to correlate with the actual software usage. In general TAM model is refereed and agreed to be an solid construct, although it is not fully without critics (Legris et. al 2003). Therefore in NOIS context we will estimate service usage level 1) with end-user's behavioral intention to use and 2) with the actual NOIS usage.

3.4 Summary

Figure 2 summarizes key measures for evaluating the successfulness of NOIS reward model.

Figure 2 NOIS reward model success measures

Customer defection	**Customer loyalty**	**Service usage**
Total defection 1. End all affairs and switch all business to another service provider **Partial defection** 2. Shift some of the current business elsewhere 3. Do more business, but from another service provider	1. Purchase intention 2. Word-of-mouth communication 3. Price sensitivity 4. Complaining behaviour	1. Behavioral intention to use 2. Actual usage

4 Theoretical foundations of NOIS reward model

To give a complete overview how rewards can influence behaviour would require volumes of text. Therefore, in the following we will give only a brief introduction to the key points relating to this issue in the offline and online context.

4.1 Definitions

In this paper by the term "rewarding" we refer to "1) something is given in return for good or evil done or received or that is offered or given for some service or attainment, 2) a stimulus administered to an organism following a correct or desired response that increases the probability of occurrence of the response" (Merriam-Webster's online dictionary, retrieved 3.2.2008). When speaking about rewarding some authors as well as practitioners prefer using the term "incentives" in stead of rewards (Antikainen and Väätäjä 2008, Reeve 2005). It has been suggested that incentives are financial or non-financial factors that provide a motive for a particular course of action, or they are counted as a reason for preferring one choice to the alternatives (Wikipedia, retrieved 1.11.2008).

4.2 Taxonomies

Previously rewarding in OSN context has been divided into monetary (tangible) rewarding and non-monetary (intangible) rewarding (also called as recognition) (Antikainen and Väätäjä 2008). In online open innovation communities monetary rewards can for example be money, paychecks, fees, trophies and awards. Non-monetary rewarding may be the member's name in honor-roll lists or top ten lists, giving privileges and public recognition. Currently both methods, monetary and non-monetary rewarding are commonly used in online communities, and it seems that rewarding definitely has an essential role for members motivations especially in online open innovation communities. Other partly overlapping classical taxonomies in academic literature include (e.g. Clark and Wilson, 1961):

1. **Remunerative vs. Moral vs. Coercive incentives – taxonomy**
   a. *Remunerative*: A person is expecting a material reward, typically money, commodities or vouchers, in exchange for his/hers action

b. *Moral*: Action is generally regarded as the right thing to do by larger social group and it is creating a sense of self-esteem and social approval.

c. *Coercive*: Physical force is used against a person (or his/hers loved ones) by others in the community, if he/she is failing to act in a assumed way.

2. Material vs. Solidary vs. Purposive – taxonomy

a. *Material*: Tangible rewards often monetary

b. *Solidary*: Intangible rewards from the act of association such as special identification, recognition, sociability, prestige and status

c. *Purposive*: Intangible rewards related to the strategic goals of the organization

It is important to notice that incentive structures and reward model are typically including a mixture of above incentive types.

4.3 Organization type and incentive structures

In the chapter 2 we defined four different NOIS actors. It is important to understand that the organization type has also an affect on the incentive structure. Utilitarian organizations, such as companies, rely primarily on material incentives, solidarity organizations, such as voluntary organizations, are driven by moral incentives and purposive organizations, such as political organisations, which rely on their stated goals to attract and retain people are commonly using moral and coercive incentives (Clark and Wilson 1961, Sanchez-Burks, J. 2005, Buckle 2003, Wasti and Can 2008). It is obvious that different organisations do have different organisational structures and cultures, which may promote or may not promote innovation behaviour in the case of certain incentive. Especially radical innovations and good learning processes require special organisational culture (see e.g. Heider 1958, Wigfield et. al 1998, Huitt 2001, McLaughlinet. al. 2008). In our opinion good practical examples of the creative organisational culture are Apple and Google, which both have a significant track record in introducing successful innovations.

4.4 Motivating users in Online Social Networks (OSNs)

Users' motivations to participate in online communities and the models explaining this phenomenon have already been studied in various studies. Earlier studies on motivations to contribute in open source communities as well as open content communities stress motivations such as fun, ideology, altruism, reputation (Antikainen and Väätäjä, 2008). Hummel et al. (2005) developed a rewarding model based on constructivistic principles and Social Exchange Theory aimed for increasing the level of active participation in Learning Networks. The incentive mechanism they developed, allowed individual members to gain personal access to additional information through the accumulation points earned by making contributions, which lead to the increased activity of participants (Hummel et al. 2005). Cheng and Vassileva (2006) on the other hand

proposed a dynamic, adaptive mechanism for rewarding contributions in an educational online community which takes into account the current needs of the community (e.g. more new contributions, versus more ratings, depending on the time since the topic is introduced and the current number of contributions) and the user's personal style of contributing (e.g. fewer but higher-quality contributions versus many mediocre ones). Cheng and Vassileva (2006) suggested that the mechanism successfully encourages stable and active user participation; it lowers the level of information overload and therefore enhances the sustainability of the community. In their study, however, they could not show the connection between rewarding model and improved quality of shared resources. Furthermore, the case of Mechanical Turk points out that members' more challenging and time consuming tasks should be paid more (Kittur et al. 2008). It seems that sometimes a passion for the object may be enough as in brand communities, but when the task is more like a job done by a professional, people need to get some kind of reward for the work. Anyhow, in the case of brand communities, the situation may be different again since the members might work hard just because they love the brand or get maintainers recognition, for example. Antikainen and Väätäjä's (2008) results indicated that in the case of non-monetary incentives, members appreciated most that some kind of praise was given by the quality of the contribution not just based on basic activities or even lottery.

4.5 Summary

As presented in the above sections, we are assured that rewards are playing an important part in motivating users in online and offline. Sadly, there is not much focused empirical research available explaining how rewards are connected to open innovation processes especially in the case of OSNs. Although, we have shown above that rewarding can be effective way to influence on user motivation, yet especially in the psychology field, some negative connections concerning motivation, creativity and monetary rewards have been presented (Amabile et. al. 1986). We must also remark that widely accepted theories on the relationship between motivations and rewarding do not exist currently (Lindenberg, 2001). This issue combined with the fact that among the academic community, there is a disagreement over the number and context of loyalty dimensions challenges us to look for more comprehensive approach to define NOIS reward model.

5. Defining NOIS reward model

Although, NOIS is an OSN, it includes strong offline structure. Therefore, we must look for a reward model which is comprehensive and suitable both in the case of online and offline context and is considering the fact the NOIS is a network.

5.1 Dimensions

In our opinion expectancy theory is a good motivational and cognitive approach for these requirements. Vroom (1964) has proposed the following equation:

Motivation =
Perceived Probability of Success (Expectancy) *
Connection of Success Reward (Instrumentality) *
Value of Obtaining Goal (Valance, Value).

In this equation each of the three factors – expectancy, instrumentality, and value – are multiplied by each other. Because of this all variables must be present in order for motivation to occur. Significantly, low value just in one variable will evidently result in a low value of motivation, while all three variables have to be high in order to gain good motivation. Interestingly, very similar loyalty model model has previously been presented by O'Brien and Jones (1995) and enhanced later on by Dowling and Uncles (1997). In this model following six factors have been suggested to define a loyalty model (i.e. reward model) value:

- Cash value of the rewards

- The range of choices of the rewards

- The aspirational value of the rewards

- The perceived likelihood of achieving the rewards

- The scheme's easy of use

- The psychological benefits of belonging to the program

The similarities between these models are clear: *First*, the perceived likelihood of achieving the rewards and perceived probability of success are nearly identical. *Second*, cash, aspirational and psychological values are sub dimensions of value obtaining goal factor. *Third*, especially the scheme's easy of use and connection of success reward are not only nicely linked together, but are also incorporated with previously introduced TAM's the perceived easy of use dimension (e.g. Davis 1989). Moreover, this relationship nicely reinforces the assumed relationship between reward dimensions and success measures for NOIS reward model. *Finally*, the "new" dimension, range of choices, is highlighting the important suggestions on the incentive taxonomies and organization types affect on the success of reward model.

5.2 From individual to network approach

However, the above interlinked reward models are more or less based on the individual's point of view. In order to define solid reward model for NOIS, individual's aspect is essential but not sufficient. Since NOIS is a value network we must calculate the sum of all motivations in the NOIS network (Amit and Zott, 2001). Therefore following enhanced equation can be defined as

Total motivation =
University motivation *
Policy Institution motivation *
Industry motivation *
Users and end-customers motivation

in which, motivation is including the sum of all individual's motivation in each organization type, in each level (i.e. strategy, management and users).

6. Discussion and conclusions

Our expectancy theory based network reward model is interesting approach from the innovation research perspective. If we want to promote open innovation activities, we must quarantine very high motivation level in the all value network. The best open innovation motivation policy is of course to keep all suggested critical motivations factors in each organization, in each level and in each individual as high as possible. However, this might turn out very difficult especially if the set utilized incentives is limited. In practice it might be a good strategy to develop mixture of innovation incentives that are lucrative for as many actors as possible, while not forgetting the importance of organisational culture and atmosphere. There probably must be some remunerative material incentive, but also some moral and coercive incentives in the well-functioning incentive system, which is providing value to not only all individuals but also to all organizations in the NOIS network. The motivation strategy which favour only small segment in the network will most likely lessen the total value of the reward model. A careful planning and testing of the open innovation reward model is needed before starting to use it. The nature of social interaction is always critical thing and we must really understand it better in the context of open innovation before we can defined solid reward model which is pleasing each actor.

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