# MASSIDEA.ORG: DEFINING A DIGITAL BUSINESS ECOSYSTEM (DBE) FOR MASSINNOVATION

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**Abstract:** This study is introducing Massidea.org from Digital Business Ecosystem (DBE) point of view. Massidea.org is an open innovation community for sharing challenges, ideas and visions. It boosts individual and communal creativity by intelligently connecting people and their insights. In Massidea.org, public, private and educational sector organizations and nations can collaborate with the wide range of people. Technologically Massidea.org is grounded on open source solution. Digital Business Ecosystem is divided into two main partitions: 1) digital (ecosystem): the technical infrastructure and 2) business (ecosystem): "An economic community supported by a foundation of interacting organizations and individuals—the 'organisms of the business world'. Therefore our Massidea.org definition will include both of these approaches. The data collection for this case study was carried out in Finland, which is one of the most competitive countries in the world.

**Keywords:** digital business ecosystem, online social network, mass collaboration, national innovation system, open innovation

## 1 Introduction

Online social networks (later OSNs) such as Facebook, Twitter, and YouTube have revolutionized the way we create networks, collaborate, share information and media content among others. OSNs generally are referred to communities and hosted online services enabling collaboration (Cachia, Compañó and Da Costa, 2007) and the creation and exchange of user-generated content in which the consumer is the creator, consumer and distributor of publically available content (e.g. OECD 2007, Le Borgne-Bachschmidt et. al. 2009). In principal, the OSNs facilitate the interaction among members by providing a dynamic platform which enables versatile services to collaboration and sharing insights. The OSNs used in people's free time have gained unprecedented popularity in recent years. Significantly, in addition to leisure, we believe that OSNs can be utilised as a critical part of national innovation systems (later NIS) (Lundvall, 2007).

Lately, growing attention has also devoted to the concept of open innovation, which combines internal and external insights as well as internal and external paths to market to advance the development of new technologies and services (Chesbrough, 2003). OSNs and open innovation are apparently changing how individuals, organizations and nations operate. To succeed in the networked economy (Shapiro and Varian, 1999) we must learn how to utilize external resources and share our insights with others in a secure, yet effective way. Especially the educational and innovation systems must evolve.

When combining a wide range of people and their different but complementary insights and creative interaction, a novel thinking outside the box is possible and mass innovations are emerging (adapted from Leadbeater, 2008). Some authors are calling this as mass collaboration, which occurs when a large group of people work independently to achieve shared outcomes through communication technologies and loose voluntary networks (adapted from Tapscott and Williams, 2006). Without OSN and supporting technology this kind of mass co-operation would be impossible.

### *1.1 Objectives of this study*

We are focusing on the very early phase of the innovation process (Cooper, 1988). Typically this first phase is named as a fuzzy front end of innovation (Smith and Reinertsen, 1991) and it includes stages from the idea generation to the further development decision (Murphy and Kumer, 1997). In this study we are introducing and defining an OSN based national open innovation system approach named Massidea.org (e.g. Santonen et. al. 2007) from digital business ecosystem point of view. The original digital business ecosystem (later also DBE) vision emerged in European Commission (Nachira, 2002) by adding "digital" to Moore's (1996) business ecosystem concept. Due to continuous research, understanding of the DBE related processes and the scientific and conceptual challenges have evolved, but it is still in its infancy (Nachira et. al. 2007) and only few practical implementation examples are available. We will introduce and illustrate Massidea.org as a business ecosystem and define included key actors and their relations and behaviour.

The data collection for this case study was carried out in Finland. According to the Global Competitiveness Report 2010-2011 Finland is not only ranked number one in higher education and training indicators but also ranked number three in innovation indicator (World Economic Forum, 2010). Moreover, in year 2008 Massidea.org was rewarded as the best school related innovation by the Finnish Inventor Support Association. As result, we argue that our case could be regarded as an extreme sample (Yin, 1990). European Social Fund (ESF) is funding Open Innovation Banking System (OIBS) - project which is implementing Massidea.org as a part of Finnish national innovation system. OIBS-project is developing and maintaining Massidea.org online social network website and related offline structures. Project is coordinated by Laurea University of Applied Sciences and lead by first author of this paper Dr. Santonen.

The paper is structured as follows: in the following section, we will define the theoretical foundations of digital business ecosystem. We, then, introduce Massidea.org concept in more detail and illustrate and explain the related digital business ecosystem. Finally, we draw the conclusions from our findings.

## 2 Introducing the Theoretical Foundations of Digital Business Ecosystem (DBE)

### *2.1 Digital Business Ecosystem layers*

The Digital Business Ecosystem (DBE) concept evolved from a research that followed from a digital ecosystem initiative by European Commission (Nachira et al., 2007). The DBE was defined as "the socio-economic development catalyzed by ICTs" emphasizing "the co-evolution between the business ecosystem and its partial digital representation: the digital ecosystem". In this view, there are two separate layers in the Digital Business Ecosystem: the digital ecosystem and the business ecosystem.

**The first layer, the digital ecosystem**, is the technical infrastructure used to connect to the services and information over the Internet and to enable the networked transactions. These include the P2P distributed software technology, automated web services, payments systems, etc. For the development of digital ecosystems, the convergence of ICT-, social- and knowledge networks is essential (Nachira et al., 2007). Considering National Open Innovation System in general and Massidea.org especially, all of them are crucial. In the forthcoming sections, we will explore these networks and the digital elements in them, such as Facebook and Google Translate, and show how they have been utilized for the Massidea.org. In our case, the elements of digital ecosystems are mainly web-based services and technologies that are accessed by people or used by software. In more broad views, digital ecosystems are considered to include also sensors, such as monitoring at home (Zatout, 2009), and typically they are defined to have self-organizing features (Briscoe, 2006).

**The second layer, the business ecosystem**, refers to the ecosystem of companies, goods, and services. The business ecosystem concept was originally developed by Moore when he suggested "that a company should be viewed not as a member of a single industry but as part of a business ecosystem that crosses a variety of industries" (Moore 1993). Furthermore, in his book, Moore (1996) recognized individuals, in addition to organizations, as the "interacting organisms" of the business world. He defines the business ecosystems as "an economic community supported by a foundation of interacting organizations and individuals – the organisms of the business world". In our case, we consider also schools, NGO's and other non-business organizations as being part of the business ecosystem. Nachira et al. (2007) also suggested broadening the meaning of term "business" to cover also volunteer work and open source communities. In our case, there are individual volunteers in two different roles; in the role of "end-user", they provide content for the innovation system, whereas in the role of "developer", they participate in and contribute for the development of the system itself.

Business ecosystems have been studied widely in literature and there are alternative definitions as well. Peltoniemi and Vuori (2004) provide a thorough review on the topic. However, for our case, these definitions do not provide any added value and thus the original definition by Moore is used.

### *2.2 Stages for the life-cycle of a business ecosystem*

In his book, Moore (1996) defined four distinct stages for the life-cycle of a business ecosystem: pioneering, expansion, authority, and renewal or death. During the pioneering stage, one should focus on defining what customers want, i.e. the value of a proposed

new product or service, and how to deliver it. In the expansion stage, business ecosystems expand to gain the critical mass and battles can arise against competing ecosystems. In the authority stage, business ecosystem should lead innovation and co-evolution providing a compelling vision that encourages other actors to improve the ecosystem. In the renewal stage, business ecosystem should work with innovators to bring new ideas or otherwise it might face death and become obsolete. Depending on the stage that ecosystem is at, there are different competitive and cooperative strategies to be used. In his thinking, Moore (1993) emphasizes the process of co-evolution: "the complex interplay between competitive and cooperative business strategies". Considering Moore's stages for our case, we can say we are still in the pioneering stage. As our case is not from the business world, the emphasis will be more on the cooperative than the competitive strategies.

Finally, for clarification, in the remainder of this paper, we will use the terms "digital business ecosystem" and "ecosystem" interchangeably to mean the whole ecosystem. We will use the term "digital ecosystem" when we want to talk about the digital part of it and "business ecosystem" when we want to talk specifically about the various businesses, organizations and individuals and their activity in the ecosystem.

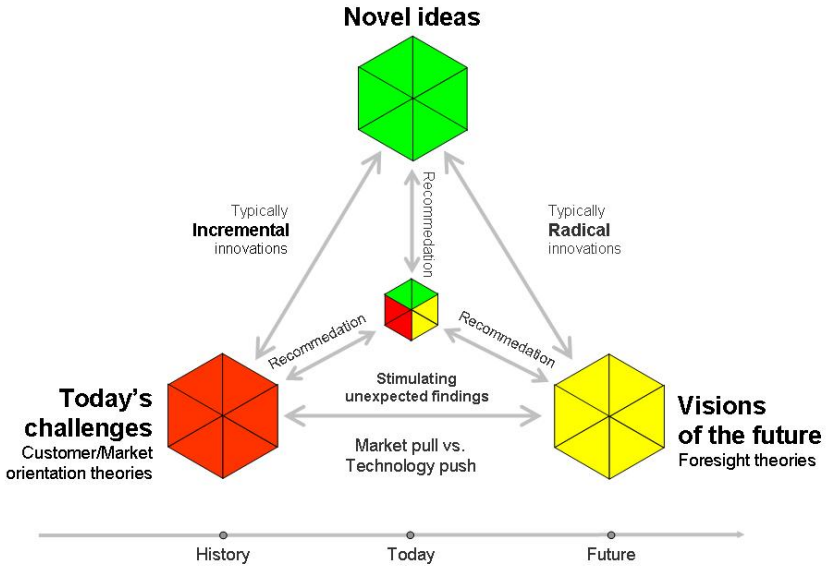
## 3. Introducing Massidea.org theoretical foundations

### *3.1 Defining the theoretical foundations*

Massidea.org founded on series innovation theories (Santonen et. al., 2007, 2008a and 2008b, 2008c, 2010, Santonen 2009, Kaivo-oja and Santonen 2010) is a free of charge open innovation community where people can share their ideas, discuss today's challenges as well as visions of the future; key factors when creating new innovations. By intelligently connecting people and their insights with the help of content recommendation, a creative space that can boost individual and communal creativity is constructed. In Massidea.org, public, private and educational sector organizations and individual users and citizens can collaborate with the wide and global range of masses of people. Technologically Massidea.org is grounded on open source solution (e.g. www.opensource.org). Figure 1 presents an Innovation Triangle framework which summarizes the theoretical foundations of Massidea.org.

With the aim of generating new ideas (i.e. the top cube) the framework includes two different yet complementary innovation sources: *first*, current market environment information, presenting today's challenges derived from history (i.e. the left cube) and *second*, future market environment information, presenting visions of the future (i.e. the right cube). Today's challenges based innovation process is producing novel ideas from practice, which typically generates small incremental improvements (i.e. incremental innovation) to current offering (Junarsin, 2009). This approach is certainly important, but it is not complete. Therefore mankind needs developers and researchers who are able expand our current understanding and knowledge into new fields by following the vision of the future. On the contrary to challenges based incremental innovations this foresight driven approach is more likely leading to real novelties. These radical or disruptive innovations and technologies are innovations which eventually overturn the existing dominant technologies and innovations in the market (Clayton, 1995).

Figure 1 The Innovation Triangle – Stimulating unexpected findings throughout content recommendation




According to Herstatt and Lettl (2004) in *technology-push* theory, an emerging technology or a new combination of existing technologies provide the driving force for an innovative product and problem solution in the market place, while in the case of "market pull" the product or process innovation has its origins in latent, unsatisfied customer needs in the market place. In practice ideas are transferring to innovations only if there is a balance between market pull and technology push. Even if idea is possible to construct and implement as a concrete entity, it does not necessarily mean that there is a market need for it.

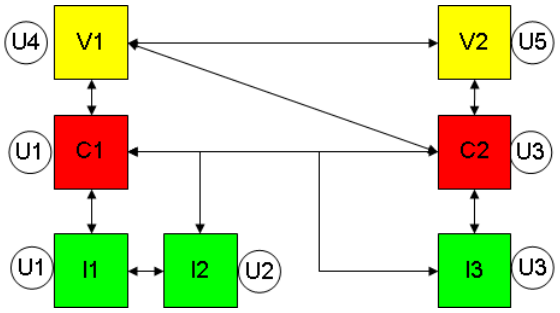
### *3.2 Increasing the likelihood of unexpected findings with content recommendation*

By integrating various content recommendation tools (Santonen, 2007) to innovation triangle (i.e. the arrows in the middle), we can increase the dynamics of the individual's creativity and increase the likelihood of occurrence of unexpected findings from expected findings. In case of expected finding, the phenomenon fits with human expectations relating the future while in case of unexpected finding, phenomenon is not coherent with the individuals cognitive and belief system and it therefore breaks the conventional habit (Santonen et. al. 2007). Serendipity for example is a process by which one accidentally discovers something fortunate, especially while looking for something else entirely (Thagard and Croft, 1999). Obviously, the likelihood of unexpected findings naturally increases, when the number of interacting users and content increases. However, without advanced content recommendation systems, the unexpected findings potential might remain modest.

In figure 2 we have presented an illustrative example of linking multiple insights and users. In figure 2 the C1 on stands for one today's challenge which has been posted by a U1 user. The U1 user has also posted I1 idea, which solves the C1 challenge. Once user 2

finds out about C1 challenge or I1 idea with help of Massidea.org functionalities supporting 1) expected findings (e.g. search functions) or 2) unexpected findings (e.g. related keywords based recommendation), he/she might post an alternative idea (I2) and link it to one or both C1/I1 insight. As a result these three contents and two users will be linked together and they are forming a network.

Figure 2: Intelligently connecting people and their insights

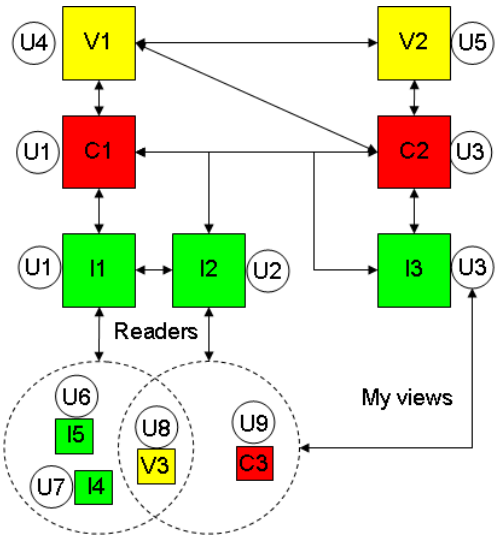



Meanwhile U3 user might be working on completely different challenge (C2) and idea (I3). However later on, he/she might similarly realize that I3 solution might also solve C1 challenge. Now the five insights and three users are linked together. If C1 challenge was related to V1 vision posted by U4 user and C2 challenge to V2 vision posted by U5 user, all seven contents and five users are linked together. Now the whole group of people (U1 to U5) and their insights (C1, C2, I1, I2, I3, V1 and V2) are linked together even though they at the first sight might not seem related.

In online social network sites such as Massidea.org, contents include group of keywords (i.e. words that capture the essence of the topic of the content). Therefore, the above network example of contents and users can easily be expanded by doing automated searches based on these user defined keywords. Showing automated search results in a one content page based on the group of keywords, which the human linked contents are together constructing, the possibility of unexpected findings is increasing. Moreover, in figure 3, we have expanded the possibilities to generate unexpected findings.

As argued in theoretical foundations section OSN including Massidea.org is affected by participation inequality, meaning most users are lurkers who never contribute. In order to make contribution as easy as possible, Massidea.org is following logged in users usage patterns. This information is then utilized to enhance the possibility of unexpected findings. In practice this means that each time user reads an insight, he/she will be included into insight's *readers list*. The list of readers show who else has been interested on this particular topic. In author's personal profile page, a summary list of all his/hers readers and his/hers own insight views are kept. Moreover, in stead of just keeping track of individual insight reads, it is possible to analyze longer usage paths and recommend content based on these paths. This combination of content recommendation approaches is seamlessly uniting content-based and collaborative recommendation system and is offering increased chance for generation of novel thoughts.

Figure 3: Expanding the possibilities to generate unexpected findings




### *3.3 Defining the key players of Massidea.org*

In order to identify the key players, 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, policy institutions and industry (Etzkowitz and Laydesdorff, 1999, 2000). In the Triple Helix model each actor has its own task: universities produce research, industries manufacture, 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.

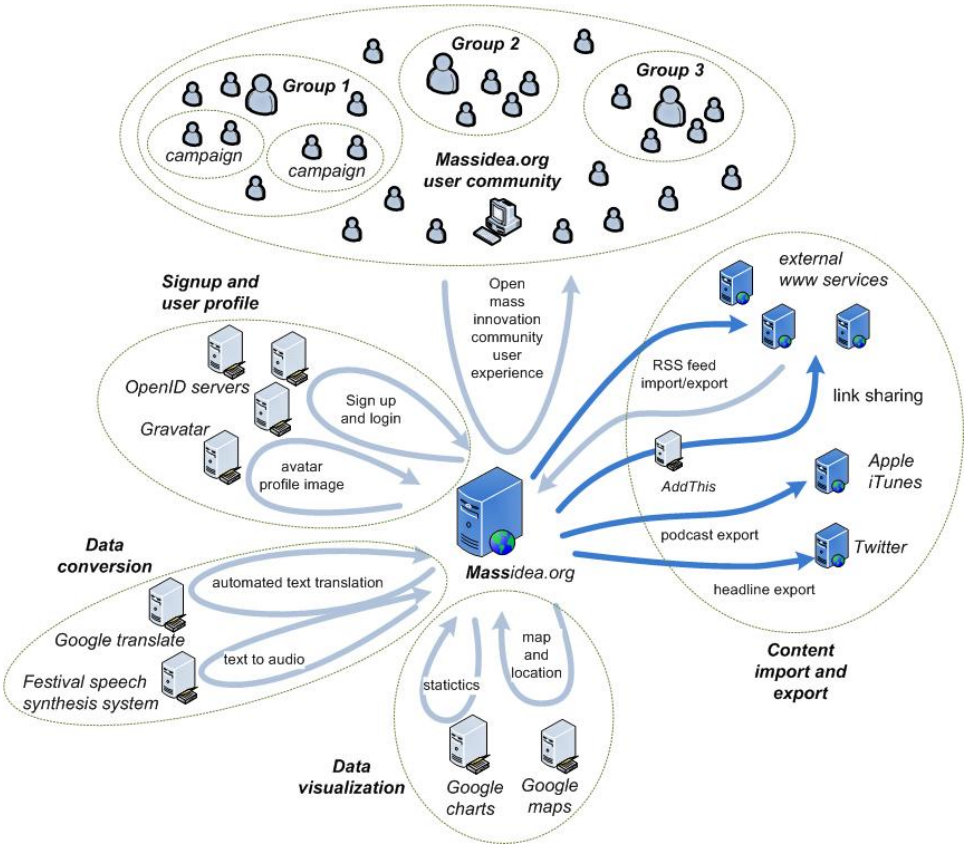
In the past, national innovation system models grounded on the Triple Helix model have been very successful. However, in our opinion Triple Helix is lacking a genuine market orientation (Kohli and Jaworski, 1990, Narver and Slater, 1990) and is not fully utilizing individual users and customers as innovators (von Hippel 1986, Urban and von Hippel 1988) and users as content creators phenomenon (Le Borgne-Bachschmidt et al. 2009), which currently are emphasized in innovation literature. Critical thinkers might say that the voice of user, consumer and people is totally missing in Triple Helix. Moreover, Triple Helix does not recognize the innovation potential of other educational sectors such as basic education and upper secondary education, which are covering children and young people. On the contrary to traditional Triple Helix model, the taxonomy for online social network based open innovation system requires strong end-user interaction and does not exclude other educational sectors besides universities. As a result main user groups for Massidea.org are: educational sector, public sector, private sector and customers.

## 4. Introducing Massidea.org as a digital business ecosystem (DBE)

### *4.1 Digital ecosystem of Massidea.org and service extensions*

The current trend among online services is extending the user experience with features provided by external web services. Application programming interfaces (API) which enable online services to interact with each other are vital tools for all online services interested on masses of users. Therefore also in the case of Massidea.org a part of the user experience is created with the help of external services. In figure 4 we have presented the digital ecosystem of Massidea.org service extensions.

In figure 4: The digital ecosystem of Massidea.org and service extensions




**Signup and user profile** (in the top left of the figure)**:** In order to create smoother sign up and login procedures OpenID and Gravatar have been integrated to Massidea.org. OpenID allows users to use existing accounts to sign in to various online services, without a need to create new passwords. OpenID as decentralized system allows anybody to use an OpenID or become an OpenID provider. In online communities an avatar is a user's representation of himself/herself in the form of a picture. With the help of Gravatar (i.e. globally recognized avatar), user register an account and upload an avatar to be

associated with the account. Then these avatars can be used in multiple online services. Currently Massidea.org does not support any other user profile extensions. However, later on the aim is to support profile integration with such services as Facebook, LinkedIn and Google which are major have massive user communities.

**Data conversion** (in the bottom left of the figure)**.** Collaborating between different users requires common language. Even if in the internet the main language is English, all users are not able understand it. Therefore, it is important to support those users which are only able to understand minor languages such as Finnish. Massidea.org's automated text translation is based on Google Translate which currently supports translation between over 50 languages. In order to provide faster load time for pages, text is translated only once and then cached for other users. Festival is multi-lingual text-to-speech system which artificially coverts normal language text into speech. Massidea.org is providing English and Finnish voices.

**Data visualization** (in the bottom of the figure)**.** The goal of data visualization is to communicate information clearly and effectively through graphical means. Massidea.org is using Google charts to illustrate user related statistic information. Google map is used for showing Massidea.org users, contents, groups and campaigns location visually on the map (feature to be published). Graphical map based user interface to Massidea.org insights offer alternative way to navigate and provide users new stimulating viewpoint to data.

**Content import and export** (in the right of the figure)**.** RSS is a data format for delivering and publishing regularly and frequently changing content. An RSS feed typically includes summarized text and some metadata such as publishing dates and authorship. Massidea.org allows both RSS import and export. At the moment recent posts (all, challenges, ideas and visions) export RSS feeds are provided. There are plans to expand RSS export to also other contents such as user, group and campaign specific feeds. In order to import additional content to Massidea.org, group and campaign page includes RSS feed import. As a result content from group's alternatively web sites or group's partner's web sites can be integrated to Massidea.org. AddThis interface enable users to bookmark and share Massidea.org content with other services. On the contrary to RSS feed which is automatic after activation, AddThis is based on user made action. As explained in data conversion section, Massidea.org supports text-to-speech conversion. Therefore, users are able to listen Massidea.org RSS feed exports also as podcasts. (i.e. a series of audio files). These podcasts are also published in Apple ITunes store. Twitter is a microblogging service which enables users to send and read other users' messages (named tweets). Tweets are short text-based posts (max 140 characters). In Massidea.org headlines from recent posts RSS feeds are exported as tweeds.

**Massidea.org user community** (in the top of the figure)**.** As defined in the theoretical foundation chapter the main user groups for Massidea.org are: 1) educational sector, 2) public sector, 3) private sector and 4) organizations and individuals, which represent customer/citizen point of view in the community. Due to space limitations of this conference paper, our user community definition in this study does not include detailed illustration of the relationships between different user groups. This will be done in the forthcoming studies. As a result this focusing Massidea.org user community will be introduced only from web site functionality point of view.

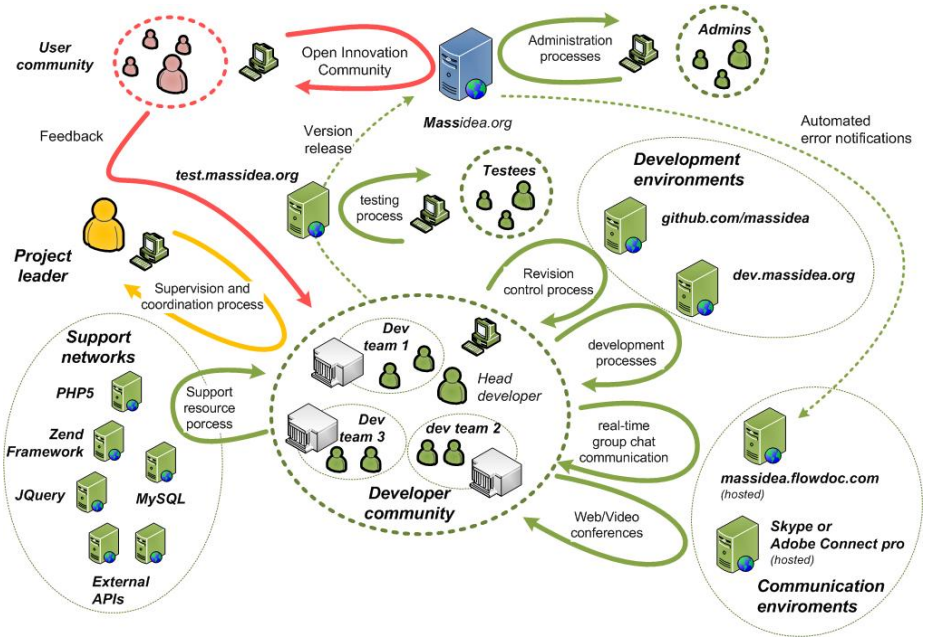
Besides individual users, Massidea.org includes groups and campaigns features. Massidea.org group collects together individual users who share mutual interest such as studies, hobbies, association activities, job or place of residence. There are two kinds of

groups: 1) open groups where all users are accepted without admin approval and 2) closed groups where participation requires group admin's approval. All group contents are visible for everybody regardless of group type. There is also a future plan to offer a private group in which all group's contents are only visible for group members. To collect multiple insights, a group can launch a campaign and combine individual user's insights into one united theme. Basically campaign is group's organized and coordinated effort to promote content production to a specified theme. Adding content to campaign requires group membership. Users link their own already published contents to a campaign and one content can be linked to multiple campaigns.

### *4.2 Massidea.org ecosystem for development activities*

According to digital business ecosystem definitions (e.g Nachira et al. 2007) the term "business" covers also volunteer work and open source communities. As defined earlier Massidea.org is also an open source solution. Therefore to gain better overall picture on Massidea.org, it is important understand the technical development ecosystem. In figure 5 we have presented a digital business ecosystem for main development activities of Massidea.org.

Figure 5: A digital business ecosystem for development activities of Massidea.org




**Developer community** (in the center of the figure). Majority of the technical development for Massidea.org is conducted by university students and student teams under supervision and coordination of European Social Fund (ESF) funded Open Innovation Banking System (OIBS) – project management. Typically students participating development tasks are performing their studies in their own home university (e.g. project works, internship or thesis) or their work has been paid by the OIBS-project.

At the moment development is carried out by multiple development teams from different universities in Finland and India. As a result the development activities are following a distributed development process in which development is carried out in multiple locations and developers do not see each other face to face on daily bases, while working collaboratively towards the common outcome. A novel studying model – named virtual internship – between project coordinator Laurea University of Applied Sciences from Finland and National Institute of Technology, Hamirpur from India has been developed. During the virtual internship students will become an active team member of a foreign country project and perform the predefined tasks from their home country with the help of various communication tools. Besides project leader a head technical developer has a key role in the development process as coordinator of coding activities and merging individual changes to new version.

**Communication environments** (in the bottom right of the figure). Depending on the tasks, students are interacting daily and weekly bases with other team members and management. For verbal communication based virtual meetings there are two main tools: Skype and Adobe Connect Pro (or similar web conference tool). When more than two locations are participating to web meeting, Skype is out of questions, since it does not allow desktop sharing for more than two locations at the same time. However, these kind of speaking based virtual meetings are taking place only once or twice a week on a predefined time. Majority of the team communication is grounded on text based real-time group chat (i.e. Flowdock). Since the history of chat is stored, this text based communication is a mixture of real-time and kind of traditional discussion thread based conversation. For some cases email and telephone is used for communication. However, aim is to limit this kind of small group communication, since other team members outside the communication chain are not able to follow the conversation.

**Development environments** (in the top right of the figure). GitHub (www.github.com/massidea) is a web-based hosting service for projects that use the Git distributed revision control system also known as version control, source control or software configuration management. GitHub manages changes to documents, programs, and other information where a group of people may change the same files. On the top of version controlling, GitHub is used for issue and testing management (i.e. to define and manage development task list and bug correction process). In stead of setting up individual development environment to a personal computer, developers are mainly relying on the central development server: dev.massidea.org. In this server each developer has their personal user account and they can modify their personal copy of the source code even if the development database is shared. This procedure allows other developers to see immediately all changes and progress of each others work. Moreover, setting up a development environment takes only few minutes comparing the rather complex setup process to a personal computing environment.

**Support networks** (in the bottom left of the figure)**.** Massidea.org technology is grounded on open source software. Open source is a development method for software that harnesses the power of distributed peer review and transparency of process as described earlier (e.g. www.opensource.org). Following technologies are used and a developer should have basic theoretical understanding and some level ability use them. **1) PHP5:** PHP is a general-purpose scripting language that is especially suited to server-side web development. **2) Zend Framework:** Zend Framework (ZF) is an open source, object-oriented web application framework implemented in PHP 5. More info is available at framework.zend.com. **3) MySQL:** MySQL is a relational database management

system (RDBMS) that runs as a server providing multi-user access to a number of databases. **4) Object-oriented programming (OOP):** Object-oriented programming (OOP) is a programming paradigm that uses "objects" – data structures consisting of data fields and methods together with their interactions – to design applications and computer programs. **4) Model-View-Controller (MVC) software architecture:** Model–View–Controller (MVC) is an architectural pattern used in software engineering, which isolates "domain logic" (the application logic for the user) from input and presentation (UI), permitting independent development, testing and maintenance of each. **5) Javascript and jQuery:** JavaScript is a language standard which is typically used to enable programmatic access to computational objects within a host environment. jQuery is the most popular cross-browser JavaScript library designed to simplify the client-side scripting of HTML. **6) CSS:** Cascading Style Sheets (CSS) is a style sheet language used to describe the presentation semantics (the look and formatting) of a document written in a markup language. **7) External APIs:** Some of the functionalities in Massidea.org are relying on external applications such as Google translator and Google maps. Therefore, external supporting resources and networks for these and other technologies are vital for developers.

**User community** (in the top left of the figure)**.** In order guidance development process, a feedback is collected from Massidea.org user community in various forms. The improvement suggestions are transferred to developer community and project management, which then are defined as GitHub issues.

## 5. Conclusions

In this study we have introduced and illustrated Massidea.org as a business ecosystem and defined key actors and their relations and behaviour. Moreover by following digital ecosystem definition we have presented the technical infrastructure of the Massidea.org and the related service extensions. Due to length limitations of the conference format, we focused especially on the development activities related digital business ecosystem. When interpreting our illustrations and definitions it is important to remember that our case sample – Massidea.org – is still in the pioneering or in a very early expansion stage as digital business ecosystem.

## 6. Acknowledgements

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