Nimis P. L., Vignes Lebbe R. (eds.)
Tools for Identifying Biodiversity: Progress and Problems – pp. 437-443.
ISBN 978-88-8303-295-0. EUT, 2010.

A Basic Business Model for Commercial Application of Identification Tools

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Abstract — Within the three-year EU project *KeyToNature* various identification tools and applications in formal education for teaching biodiversity have been researched and developed. Building on the competencies of the involved partner organisations and the expertise gained in this domain, the paper outlines a business model which aims at commercially exploiting the project results on a broader scale by describing the value proposition, products & services, value architecture, revenue model and the intended market.

Index Terms — business model, identification tools, exploitation, sustainability, EU project.

1 Introduction

From September 2007 to the end of 2010 the *KeyToNature* project mobilises 14 partners from 11 EU countries in the *e*Content*plus* Programme, with a total budget of 4.8 Million Euros. The main objectives of *KeyToNature* are to: 1) increase access and simplify use of e-learning tools for identifying biodiversity, 2) improve interoperability among existing databases for the creation of identification tools, 3) optimise educational efficiency and increase quality of educational contents, 4) add value to existing identification tools by providing multilingual access, and 5) suggest best practices against barriers that prevent the use, production, exposure, discovery and acquisition of the digital contents required for designing the identification tools [1].

Software packages developed in recent decades, which enable the rapid and easy creation of interactive identification tools, are the driving forces behind

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the switch from traditional paper-based keys to multimedia and online versions with their many advantages. These interactive identification tools are not only important for the educational sector, but can also be used to solve identification problems in many industrial application areas. The basic assumption of the *KeyToNature* project, namely that these tools should not only be usable by a few experts, but made applicable for pupils and students by reengineering them to fit their needs and wants, also applies when aiming to reach a broad audience of potential customers in industry: usability, support of multiple languages, aesthetic appeal, the possibility to easily enhance or change parts of the derived keys by adding user generated content, etc., are all factors that are equally important, irrespective of whether the tools are applied in the classroom or in professional environments.

In order to exploit the knowledge gained in the project in the best possible way and thus being able to keep the developed services and tools up to date and usable, a sustainable business model is needed. This will ensure that solutions for the educational field, which are already now used by a large number of *KeyToNature* associated members like schools and universities all over Europe, can be provided even after Community funding ends. This could also help interested project partners to generate returns on their investments in the project, as about half of the budget was financed by their own resources.

In order to analyse the potential of a business, traditionally two different approaches were used: 1) the resource-based view, which focuses on the core competencies and the unique access to resources a company has in order to build competitive advantage (for an overview of the most important works see [2]), and 2) the market-based view, which emphasises the industry with its competitors, customer segments and regulations in which the company has to be successfully positioned [3]. Both approaches are still important when developing a new business, although the main innovation often lies in the business model, especially when modern ICT (Information and Communication Technologies) plays a crucial role in the business [4].

Chapter 2 thus first describes the products developed within the *KeyToNature* project in order to better understand the resources which can be used for exploitation when designing the business. The following chapter then introduces a hypothetical business model and briefly outlines the market strategy.

2 Identification Tools and Results of *KeyToNature*

The identification of organisms is fundamental in biology. An accurate identification provides a correct name through which detailed information such as taxonomic descriptions, ecological relations, economic values, conservation status, legislation status and genetic code can be unlocked [5].

Identification is done by observing certain characters of an organism and subsequently using the respective character states in a structured way by applying a key to retrieve the correct name. This approach can not only be applied for identifying organisms in the field of biology, but basically applies to any identification problem. The tools generated and the expertise gained within *KeyToNature* can thus in principle be generalised to other fields of application.

The following figure gives an overview of the main elements of the *KeyToNature* system architecture:

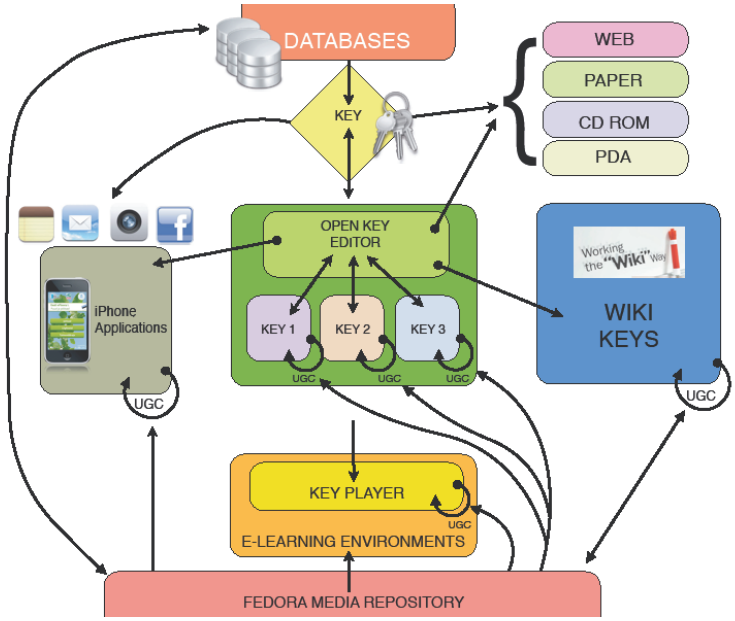

Fig. 1 – The *KeyToNature* system architecture [6].

The heart of the system architecture is formed by the keys. The whole system is primarily aimed to be used online, but the keys can also be made available offline, e.g. for use abroad in the field with mobile phones, where Internet connection fees are expensive or when no Internet connection is available at all. They can thus be web-based, paper-based (i.e. printed out), provided on CD-ROM or on PDAs/mobile devices.

The keys are normally based on data stored in relational databases and software packages like FRIDA and LINNAEUS which dynamically generate the actual sequence of questions step per step. Within the *KeyToNature* consortium the following two tools are being developed by project partners:

FRIDA (FRiendly IDentificAtion) is an original and flexible program developed by S. Martellos and patented (2002) by the University of Trieste. FRIDA is based on a relational database and can automatically generate both interactive identification tools accessible online, and traditional, dichotomous paper-printed identification keys.

LINNAEUS II is developed and sold as a product by ETI. There are three 'modules' of Linnaeus II: the 'Builder' to manage data and to create an information system, the 'Runtime' engine to publish completed information systems on CD-ROM/DVD-ROM, and the 'Web Publisher' to publish a completed project as a Web site.

Besides the primary data (information that generates the actual key) these software packages make use of secondary data like pictures, drawings, sound

and text files in order to present the user with supporting information to the current identification step and the finally derived organism. In *KeyToNature*, a FEDORA (Flexible Extensible Digital Object Repository Architecture) media repository is used to this end as a supplement to multimedia data stored directly in the key database. FEDORA is a conceptual framework that uses a set of abstractions about digital information to provide the basis for software systems that can manage digital information.

In order to make the output of software packages like FRIDA and LINNAEUS compatible and editable in other tools, a certain standard needs to be adopted. *KeyToNature* has decided to adopt the SDD (Structured Descriptive Data) standard proposed by TDWG (Biodiversity Information Standards, formerly Taxonomic Database Working Group). The goal of the SDD standard is to allow capture, transport, caching and archiving of descriptive data in all forms, using a platform- and application-independent, international standard [6].

The keys generated by software packages capable of producing SDD files can then be adapted to produce localized minikeys, for specific applications such as school gardens, parks and reserves, or enhanced with user-generated data by using the Open Key Editor.

Many keys made available by the data providers are ‘master keys’ including many species. Long keys are complicated and have redundant information when used in an area with fewer species, such as a park or nature reserve, or a school garden. The Open Key Editor allows users to ‘crop’ a master key and customize it for a given set of species. The ‘cropped’ key can then be edited for language and illustrations (e.g. to suit a particular user level, or platform such as the mobile phone). With the Open Key Editor the user can browse existing master keys and edit them.

The Open Key Editor has two further important features: 1) it permits to largely solve the problem of translation: once a “large” key has been translated into a given language, it is possible to derive from it a high number of smaller keys adapted to the users’ needs without the need of further translations, 2) It permits users to add to the key user-generated content in their own language, thus enhancing considerably the degree of interaction between users and *KeyToNature* identification tools. The Open Key Editor was developed and optimized jointly by the University of Trieste and ETI and is based on open source software. In addition to access on the Internet, output on mobile platforms was included [6].

Keys for mobile devices form further important elements of the system architecture. Many of the keys can be used in the field on PDAs or iPhones, both in stand-alone and in online versions. Tools like the MobilePackager developed by *KeyToNature* partner GIUNTI Labs increase the benefit of the keys by giving users the important possibility of adding user-generated content (in this case geo-referenced pictures) directly in the field, using their mobile devices.

Another useful tool developed in the course of the *KeyToNature* project is IBIS-ID (Interactive Biodiversity Identification Software): it is a “key player software tool” created to help the users in the process of identification of species or other taxa, by using the multi-access keys described in a SDD (Structure of Descriptive Data) file. It is based on the Adobe Flex technology, a well suited

candidate because of its effectiveness for data driven interactive applications and native support for dealing with data organized in XML (eXtensible Markup Language) structured files through the support of the ECMA e4x (ECMAScript for XML) standard [7].

Last but not least it is also possible to comfortably view and edit keys in Wikis, the so called “wiki-keys”. *KeyToNature* developed two tools to this end, the jKey player and jKey Editor: The jKey key player (http://www.keytonature.eu/wiki/JKey_Player) is a small javascript, that allows wiki-keys - in addition to their printable overview display - to be also “played” step-by-step, similar to the FRIDA and Open Key functionality. The complementary jKey Editor (http://www.keytonature.eu/wiki/Wiki-based_identification_key_editor) allows form-based editing of the identification keys.

3 A Basic Business Model for Exploitation

A business model is a model of an existing business or a planned future business. A model is always a simplification of the complex reality. It helps to understand the fundamentals of a business or to plan how a future business should look [8].

In the following the key elements of a business model for the possible commercial application of some identification tools and expertise developed within *KeyToNature* is presented:

The value proposition, which describes the key value generated for the main customers and business partners: In our case the key value is supporting customers in solving complex identification problems by utilising expertise and tools of the value chain partners.

Product/market design: The primary end user groups for the *KeyToNature* project are pupils/students and their teachers in formal learning environments. The main products generated in the project are software keys for identifying organisms, which are embedded in learning management systems to provide an adequate context for the respective target group. The formal education market is a difficult one in terms of generating revenues. However, the authors believe that it can be continued to be served for free if maintenance and further development of the software tools can be mainly financed through other commercial activities. Although the identification tools could in principle be applied to any industry with identification problems (e.g. through software keys for identifying bacteria in medicine, or for identifying diseases starting from a series of symptoms) the first step will be to offer the existing tools to a market where there is already relevant domain expertise in the partner network through existing data providers (e.g. plants, certain animals, microfungi). The new business shall thus start off with software keys for desktop and mobile devices in this field as products. The customers could be sought in the B2B area, while individual partners of the network may also address the B2C market directly. Examples of potential customers are nature parks, who want to provide their visitors with specific mobile keys to their flora and fauna. Already in the past it could be proved that this market is worth addressing.

The value creation architecture outlines in which steps the product will be

generated and which partners and competencies are necessary. The following figure outlines the value chain:

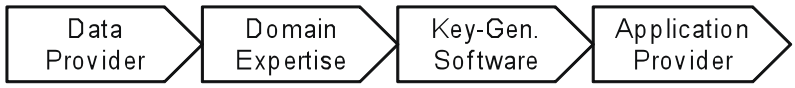

Fig. 2 – Value chain of the proposed business model.

When a customer wants support in solving identification problems (for example, a key to the plants in a nature park in Catalonia), a specific software identification tool is provided as a product. It is based upon data provided by one of the data providers who own primary data (i.e. master keys) and secondary data (multimedia files), in our example this might be the Royal Botanical Garden of Madrid with the eflora Iberica database. If the customer cannot provide a list of all species that are in the relevant set, a domain expert (who might be from the Royal Botanical Garden or some other institution), it will be necessary to analyse the situation locally. The master key data together with the list containing the relevant subset of species is then passed on to a key generating software (e.g. the University of Trieste with their FRIDA software or ETI with LINNAEUS, etc.), who produces the specific interactive key. Finally, a developer (e.g. the *KeyToNature* project partner EVOLARIS or Divulgando, a University of Trieste spin-off) creates an application and customized user interface according to the customer's needs and wants (e.g. an iPhone application).

The proposed business model thus draws upon expertise of various partners to solve the problem of the customer. If one of the partners could serve the customer's needs alone, then there is no need for cooperation and the business model doesn't work there. Sometimes this may be the case for data providers, who are at the same time key generator software vendors. But in many cases they may either lack the required master data, resources to build the list containing the subset of relevant species, or the know-how to build the final application with outstanding user experience, e.g. for Apples iPad.

The value architecture could be set up in a way that a newly founded company following the proposed business model could flexibly collaborate with any organisation able to deliver value in one of the four stages through classic buyer-seller-relationships. In the first instance however, the main suppliers of this company could be those *KeyToNature* project partners who decide to join the value creation network.

Revenue model: In order to be able to offer the products and services described above to the market, a company would need to be established, ideally a Ltd. or the like to limit personal liability of the involved individuals in case of potential losses. This company could have the following main objectives: marketing & sales, i.e. finding suitable customers and contracting with them, and sourcing the necessary expertise and tools within the partner network. The company should thus be kept very lean regarding production capacities – here all steps should be outsourced to *KeyToNature* partners and potentially further network members, especially *KeyToNature* associate members. The new company thus would need to manage the partner network to orchestrate the value chain,

negotiate contracts with the customers and ensure proper service through service level agreements. All partners in the network could freely negotiate what they want to get in return for providing their expertise and tools to the company so that the final product could be created. For its services the company should retain the difference between the revenues it could generate from the market and the costs incurred for the services of the business partners.

4 Conclusion

The paper presents tangible outcomes of the *KeyToNature* project and a basic business model for their commercial exploitation. Based on this model a sound business plan with detailed analysis of costs and revenue forecast needs to be developed in order to establish a sustainable business. All *KeyToNature* partners and further interested suppliers of data, expertise, and tools are invited to collaborate with the company, if and when this shall be founded.

Acknowledgement

This work has been supported by the *KeyToNature* project, ECP-2006-EDU-410019, in the frame of the *e*Content*plus* Programme.

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