IBISBA 1.0
Industrial Biotechnology Innovation and Synthetic Biology Accelerator

Deliverable D2.2
An electronic knowledge book describing IBISBA 1.0 facilities and expertise

Planned delivery date (as in DoA): M24
Actual submission date: 22/11/2019, month M24
Workpackage: WP2
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Deliverable leader: INRA
Version: 1.0

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<td>PU Public</td>
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<td>CI Classified, as referred to Commission Decision 2001/844/EC</td>
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<td>CO Confidential, only for members of the consortium (including the Commission Services)</td>
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This deliverable is part of a project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730976.
1 Summary

An Ibisba1.0 electronic knowledge book (eKBook) has been implemented from different sources of knowledge (the DoA, the Ibisba1.0 website, the IbisbaHub, the TasCu website and others available documents) related to the project. The Ibisba1.0 eKBook is available at the following url: http://thot.i2m.u-bordeaux.fr/ibisba10. Ibisba1.0 eKBook describes the facilities, the expertise domains and the services of the partners, infrastructures and platforms of the Ibisba1.0 project.

2 Introduction

The electronic knowledge-book (eKBook) is a web-based, electronic hypertext for the dissemination and the transmission of knowledge. A hypertext technique has been chosen that allows a non-linear and non-sequential structuring of knowledge. As a consequence, the user is not obliged to read and follow knowledge in a sequential linear way. Following graphical hyperlinks, the user has the ability to navigate (browsing) freely, choosing between different pathways in the content. Ibisba1.0 knowledge assets are represented in the eKBook using concept maps (see for instance Fig.2). The concept map facilitates an abstract representation at high level which allows an instantiation to a different context. The concepts in each concept map are hierarchically structured through semantic relationships. Each general concept is defined by other more specific sub-concepts or by a natural language explanation. The development of the Ibisba1.0 eKBook started with the acquisition and the assimilation of vocabulary and knowledge related to the field of Industrial Biotechnology by means different sources of knowledge:

- Ibisba1.0 website https://www.ibisba.eu/
- DoA, scientific documents
- Ibisba1.0 Hub https://hub.ibisba.eu/
- TasCu website https://tascu.vtt.fi/tascu/user/login

3 Results

3.1 Ibisba1.0 Electronic Knowledge Book

The Ibisba1.0 eKBook is usable on the web portal linking concept maps (see example in Fig. 2), knowledge sheets (see example in Fig. 4), pdf documents, other external resources such as websites or visual tools processing data-driven documents by using parallel coordinates (see section 3.2) and Concept network browser (see section 3.3). Figure 1 displays the homepage of the Ibisba1.0 eKBook where the main concepts IBISBA Facilities, IT Facilities, R&D services, DTBL-P, Work packages, Organism, Products and Biomass allows to describe the Ibisba1.0 project in the whole.

Figure 1: Homepage of the Ibisba1.0 eKBook

Figure 2 displays a concept map (CMAP) describing the Toulouse White Biotechnology (TWB) infrastructure hosted in INRA. It provides access to 2 platforms (ASE and ACP); offers services related to the Test step; possesses different expertise domains such as Screening, Robots, etc and services like Omics and Analytics. The main concepts of CMAPs are the scientific objects of study, which are connected by links expressing and describing relationships with other sub-concepts, existing between them. The choice of such a representation creates a favourable situation to disseminate and assimilate knowledge.
Figure 2: CMAP describing the Toulouse White Biotechnology (TWB) infrastructure hosted in INRA.

Figure 4 displays the knowledge sheet describing the procedural knowledge associated with the concept *Scale-up with filamentous fungi* described by the cmap in Fig.3. Knowledge sheets, used to represent procedural knowledge, carry direct information on the concepts (see for instance *Scale-up with filamentous fungi* in Fig. 4). A sheet is composed of several fields of information that are clickable (chart of title, illustrations, an explanation associated with the illustrations, authors, keywords, links to other knowledge sheets and references, etc, see the example in figure 4).

Figure 3: CMAP describing the R&D service of Scale-up with filamentous fungi.
Figure 4: knowledge sheets describing the R&D service of Scale-up with filamentous fungi.

Table displays the means of each icon used in the Ibisba1.0 eKBook.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Meaning</th>
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<tr>
<td>Geographic map</td>
<td>Concept-map / CMAP</td>
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<tr>
<td>Technical sheet</td>
<td>External resource</td>
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Table: icons meaning
3.2 Representation of the Ibisba1.0 network

Interactive parallel coordinates have been used and implemented in the Ibisba1.0 eKBook to visualize the network of Ibisba1.0 project (see an overview in Fig. 5 directly accessible by clicking on Network menu item in the section IBISBA of the Ibisba1.0 eKBook). Each vertical axis corresponds to a concept namely Partner, Infrastructure, Platform, Domain of expertise, TNA offer and DTBL-steps.

![Figure 5: An overview mapping the relationship networks of Ibisba1.0 components](image)

![Figure 6: An overview mapping the relationship networks of Ibisba1.0 components by specifying Fraunhofer and the platform IGB (Interfacial Engineering and Biotechnology)](image)
A specific colour is attributed to each partner. This representation allows the visualisation and analysis of multivariate data. By using cursors, we may select either a specific partner or an expertise domain of a TNA offer or a step or all at the same time. For instance, Figure 6 reveals that the Fraunhofer's IGB platform counts *downstream processing* among its expertise domains and offers a *fermentation process* within the TNA offer. Interestingly, this kind of representation also provides the means to reveal knowledge gaps, using the value *unknown* in vertical axes.

3.3 Representation of the R&D services network of Ibisba1.0

Interactive *concept network browser* has been used and implemented in the Ibisba1.0 eKBook to visualize the R&D services that may be provided by each partner of the Ibisba1.0 project (see Fig. 7). This network is directly accessible by clicking on the R&D services box in the homepage.

Figure 7: An overview of the network linking the R&D services of each partner to partners.

Figure 8 (resp. Figure 9) displays the set of R&D services in bold that may provide the *Automated Culture Process* platform available in the infrastructure TWB of the partner INRA (resp. the set of platforms capable of providing the R&D service *Automated strain construction*).
Figure 8: overview of concept network browser displaying the set of R&D services in bold associated to the platform ACP of INRA.

Figure 9: overview of concept network browser displaying the set of platforms in bold associated to the R&D service Automated strain construction.
4 Encountered difficulties

The vocabulary and terms used in the website as well as IbisbaHub, Tascu and R&D services catalogue have undergone changes since the beginning of the project and a harmonized vocabulary and glossary of terms has not yet emerged, although this is expected in the near future. Similarly, the project's concept (“IBISBA vision”) has undergone significant evolution. These modifications will inevitably induce changes in the structure and terms of the Ibisba1.0 eKBook. An example is the lack of consistency between the vocabulary used in the R&D services catalogue provided by WP4 and the expertise domains that are embodied in TNA offers described at the Ibisba1.0 website. In conclusion, to construct a consensus structure that can be used and understood by all partners, it will first be necessary to define a minimal set of common vocabulary, allowing for example TNA offers and those in the service catalogue to be interlinked.

5 Prospects

Organism, Product and Biomass concepts-sections have been added in order to enrich the Ibisba1.0 eKBook. The idea of proposing this triplet (Organism, Product, Biomass) is to create a causal relationship between feedstock (some biomass resource), catalyst (an enzyme or an organism) and product. In the example the biomass is not shown, but could be glucose; the catalyst is the yeast Pichia pastoris and the product is Invertase. This relationship can be associated with protocols and workflows that are stored in the IbisbaHub (see Fig. 10).

![Diagram of interlinking CMAPs](image-url)

Figure 10: Interlinking CMAPs (in this case yeast to invertase protein) and creating the possibility to link up the knowledge sheet to the IbisbaHub
6 Conclusion

An Ibisba1.0 eKBook has been implemented describing the project and is available at this address http://thot.i2m.u-bordeaux.fr/ibisba10. The formalism employed to build the eKBook provides the means to enrich and update it without destructuring the whole Ibisba1.0 eKBook. Ibisba1.0 eKBook is evolutive, particularly concerning the propositions mentioned in the previous section.

7 Partners involved in the work

All