

Meta-modeling technological ecosystems in different application domains





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Metamodel for the definition of technological ecosystems focusing on knowledge management

Hi!

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1. Introduction

1.1 Knowledge management (I)

According to Castells, the Knowledge Society is a society in which the conditions of knowledge generation and information processing have been substantially altered by a technological revolution centred on information processing, knowledge generation and information technology.

Knowledge Society → Learning Society



1.1 Knowledge management (II)

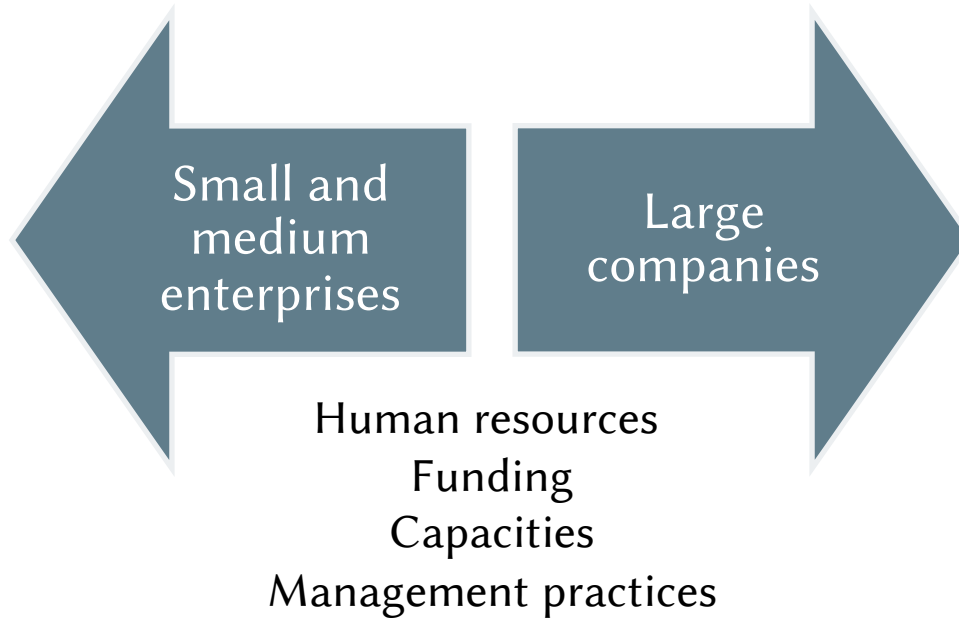
The evolution of the Information Society into the Knowledge Society is directly related to the evolution of information systems

Knowledge management emerges as a competitive advantage in any type of organisation (Nonaka and Takeuchi, 1995)

1.1 Knowledge management (III)

- ◎ Knowledge management is not only associated with managing knowledge as a resource, but also with managing the business processes that are carried out using that resource

1.1 Knowledge management (IV)



1.1 Knowledge management (V)

- ① Knowledge management systems provide the necessary tools to support processes and facilitate access to and re-use of knowledge (Natali and Falbo, 2002)
- ① Different models of knowledge management have emerged that focus on the human factor and place technology as another element within the model (Rubio, Ocón, Galán, Marrero and Nelson, 2004; Fidalgo-Blanco, Sein-Echaluce and García-Peñalvo, 2014)





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<http://nyphotographic.com/>

1.2 The technological ecosystem (I)

- ① Technological ecosystems emerge to solve knowledge management problems in heterogeneous contexts, being considered the evolution of traditional information systems (Laudon and Laudon, 1991; Langefors, 1977)
- ② The ecosystem metaphor comes from the area of biology and has been transferred to the area of technology to reflect the evolutionary nature of software systems.



1.2 The technological ecosystem (II)

A set of organisms or biotic factors, the physical environment they inhabit or abiotic factors, and the relationships both between organisms and between organisms and the environment.

Natural ecosystem

1.2 The technological ecosystem (III)

- ◎ In a technological ecosystem, there is a set of people and software components that play the role of organisms; a set of elements that allow the ecosystem to function (hardware, networks, etc.); and a set of information flows that establish the relationships between the software components and between them and the people involved in the ecosystem





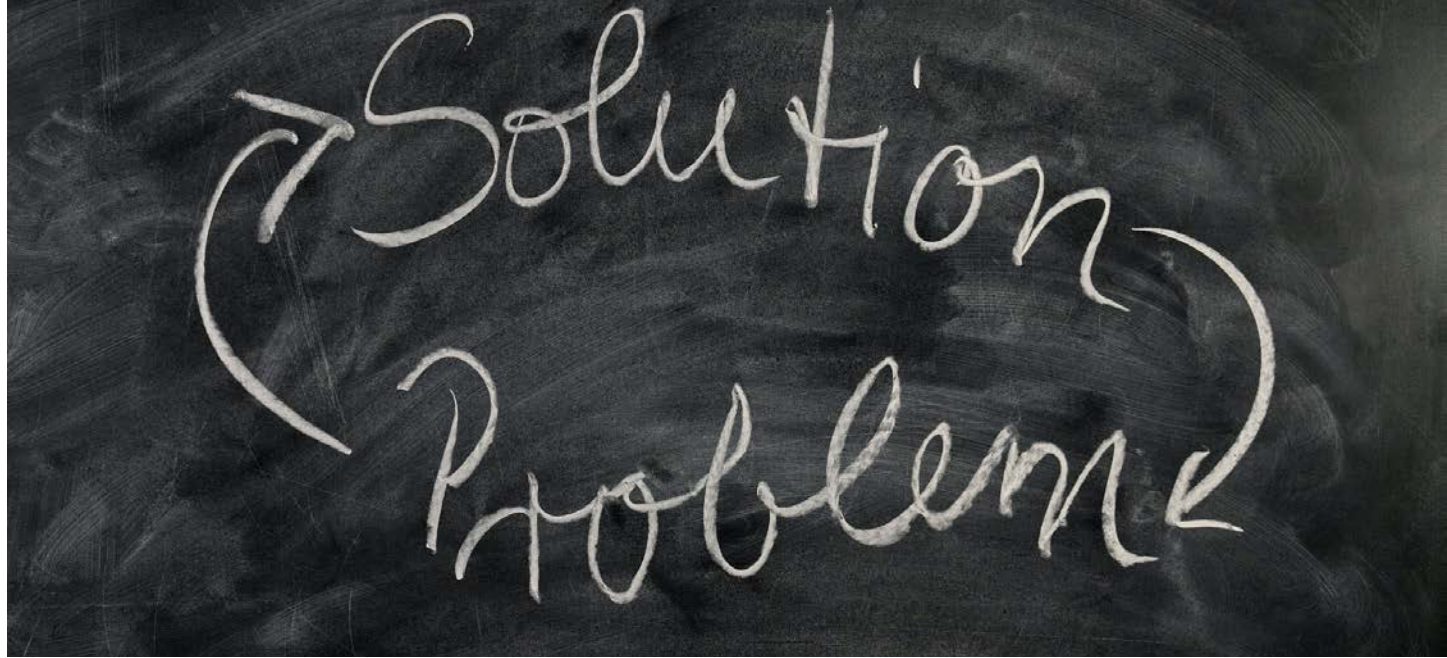
1.2 The technological ecosystem (IV)



Ecosystems must be able to combine some of the tools that already exist for managing knowledge, such as CMSs and repositories, and they must be able to incorporate emerging tools as well as eliminate those that are obsolete or not used by users



They must also be able to incorporate emerging tools, as well as eliminate those that are obsolete or not used by users



1.2 The technological ecosystem (V)



Despite the advantages, this type of development presents a great deal of complexity

It requires knowing and selecting the right systems and services; achieving a high degree of integration and cohesion; allowing the ecosystem to evolve and adapt to the changing needs of the environment and users



2. Example of a real technological ecosystem



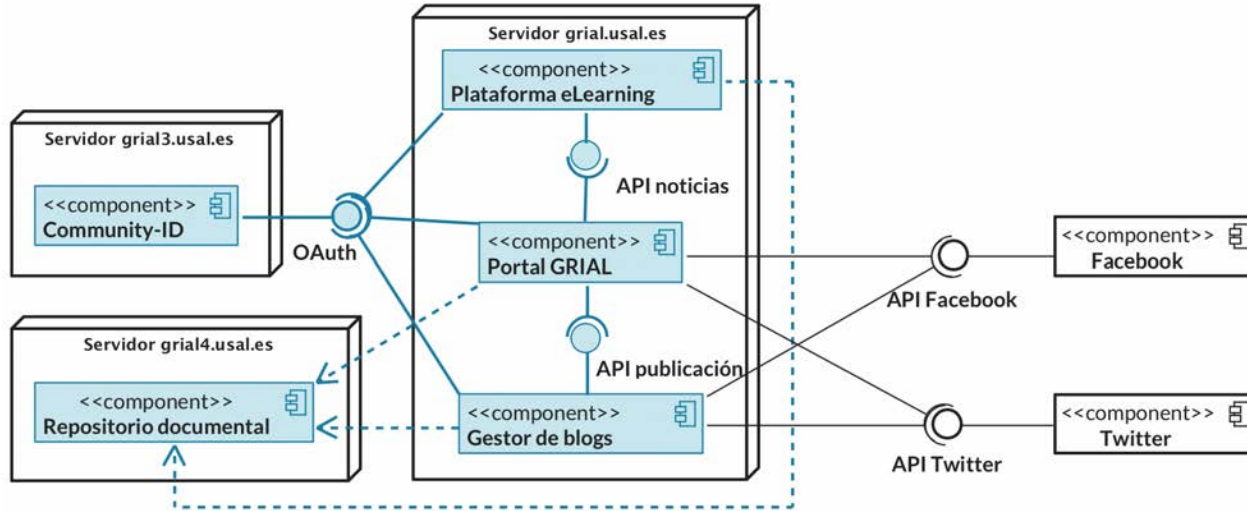
GRIAL Ecosystem (I)



- ◎ Since 2010 in continuous evolution
- ◎ Internal and external knowledge management
- ◎ Sustainability of the research group

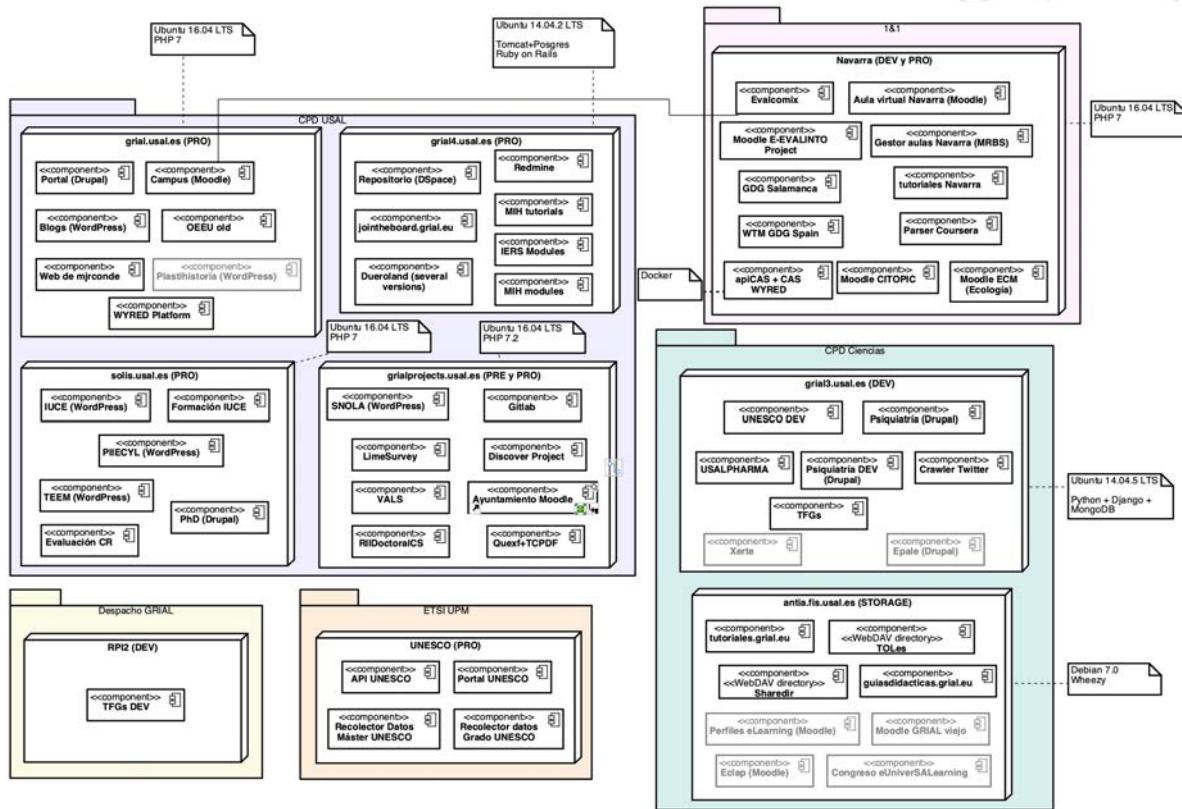
GRIAL Ecosystem (II)

Initial situation



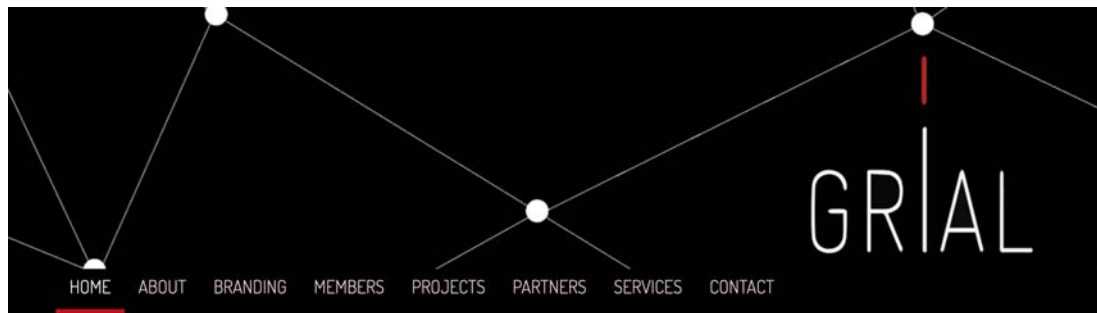
GRIAL Ecosystem (III)

Current situation



GRIAL Ecosystem (IV)

Public portal <https://grial.usal.es>



Recent news

Llamada a trabajos VII Jornadas Iberoamericanas de Interacción Humano-Computador

Submitted by admin on Mon, 22/03/2021 - 23:44



por la Universidade Presbiteriana Mackenzie (São Paulo).
Read more 41 reads

Las VII Jornadas Iberoamericanas de Interacción Humano-Computador es un evento anual que se encuentra en su séptima edición, siendo la primera vez que se organiza en Brasil. Este evento tendrá lugar entre el 8 y el 10 de septiembre de 2021, la participación de los autores será en formato online, organizado

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 Fran Garcia Peñalvo @frangp

Llamada de trabajos del International Conference of Research in Education -- IRED'21

Los retos de la investigación educativa post-pandemiaired2021.grial.eu/llamada-a-trab...

GRIAL Ecosystem (V)

© Websites management system <https://agora.grial.eu>



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Espacio dedicado a las actividades del Grupo de Investigación GRIAL para acercar la ciencia a la sociedad

QUIÉNES SOMOS ▶



GRIAL Ecosystem (VI)

© Virtual campus <https://polis.grial.eu>

Research Group in Interaction and Elearning University of Salamanca

everything is connected

Access to the platform

Username

Username

Password

Password

Log in

Forgotten your username or password?

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TOL ACLOG
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GRIAL Ecosystem (VII)

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Choose a community to browse its collections.

	Building the future of Latin America: Engaging women into STEM W-STEM
	DEFINES project A Digital Ecosystem Framework for an Interoperable Network-based Society (DEFINES)
	E-EVALINTO Project Evaluation environment for fostering intercultural mentoring tools and practices at school

Discover

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Date issued	
2020 - 2021	320
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GRIAL Ecosystem (VIII)

Project management <https://redmine.grial.eu>

Home My page Projects Administration Archived repositories Help

Logged in as greatadmin My account Sign out

GRIAL Project Management

Search:

Projects New project | View all issues | Overall spent time | Overall activity

View closed projects [Apply](#)

Congresos/eventos

Proyecto que reúne todas aquellas tareas asociadas a los eventos, congresos, seminarios, etc. que realizamos desde GRIAL.

ECM Moodle

Plataforma de formación online para la empresa ECM Ingeniería Ambiental <http://ecmingenieriaambiental.com> financiado por la TCUE Desafío Empresa de 2017.

HIPPOCAMPUS

European Project "Promoting Mental Health and Wellbeing among Young People through Yoga" funding by Erasmus+ Programme.

INTRAS

Proyectos relacionados con la colaboración INTRAS-GRIAL.

- DISCOVER**
Tienda online de productos sociales. Tienda online tipo [Etsy](#) orientada a la venta de productos realizados por los pacientes dentro de complejos asistenciales como parte de talleres, actividades, etc.
- SocialNet**
Red social para pacientes y familiares.
- TE-CUIDA**
Ecosistema Tecnológico para apoyo a CUIDAdores asistenciales

Miscelanea

Todas aquellas tareas que surgen en el día a día de un grupo de investigación.

Navarra

Plataforma de formación: Moodle, gestor de reservas, tutoriales, etc.

OEEU

OEEU Barómetro Grados
Subproyecto OEEU para el barómetro de Grados.

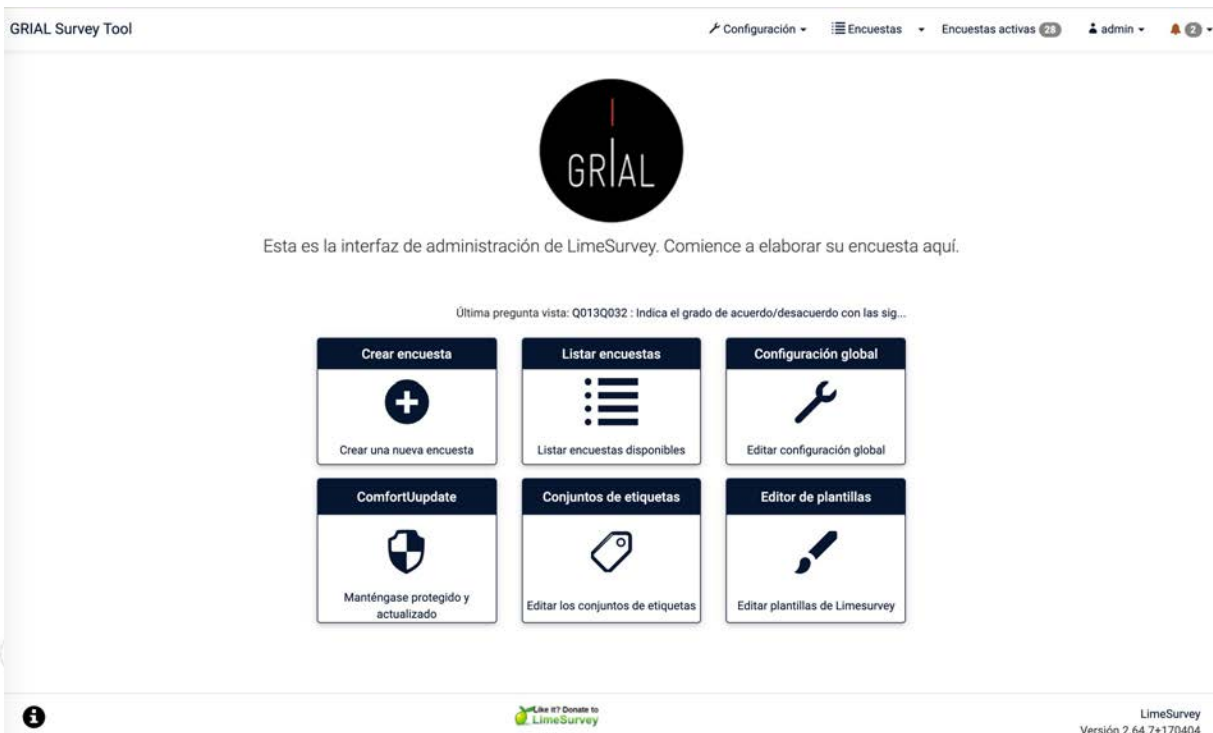
Deberíamos documentar las cosas más relevantes y fallos que haya que solventar de cara a las siguientes partes del proyecto

OEEU Barómetro Máster
Proyecto de Barómetro para

Portal de GRIAL

GRIAL Ecosystem (IX)

© Survey tool <https://limesurvey.grial.eu>



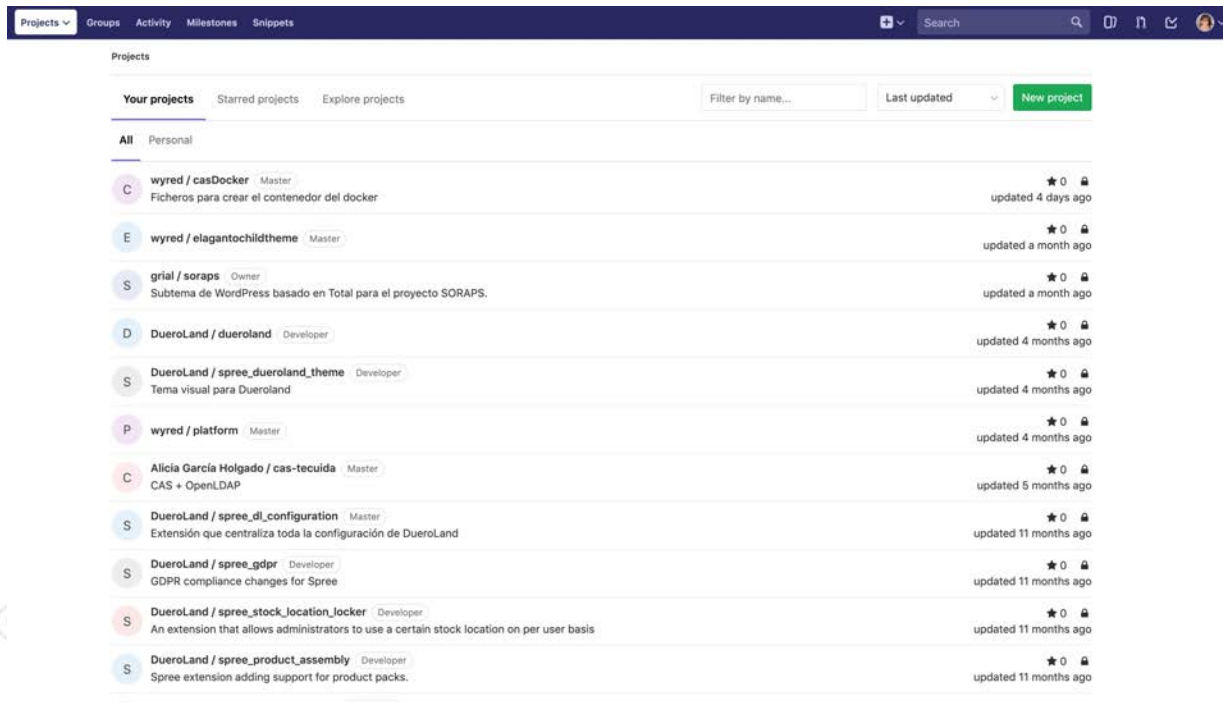
The screenshot shows the GRIAL Survey Tool administration interface. At the top, there is a navigation bar with the following items: "Configuración", "Encuestas", "Encuestas activas 28", "admin", and a notification bell icon with "2". The main content area features the GRIAL logo (a black circle with "GRIAL" in white) and a welcome message: "Esta es la interfaz de administración de LimeSurvey. Comience a elaborar su encuesta aquí." Below this, a status message reads: "Última pregunta vista: Q013Q032 : Indica el grado de acuerdo/desacuerdo con las sig...". The interface is organized into a grid of six action buttons:

- Crear encuesta**: Represented by a plus sign icon, with the description "Crear una nueva encuesta".
- Listar encuestas**: Represented by a list icon, with the description "Listar encuestas disponibles".
- Configuración global**: Represented by a wrench icon, with the description "Editar configuración global".
- ComfortUupdate**: Represented by a shield icon, with the description "Manténgase protegido y actualizado".
- Conjuntos de etiquetas**: Represented by a tag icon, with the description "Editar los conjuntos de etiquetas".
- Editor de plantillas**: Represented by a pencil icon, with the description "Editar plantillas de Limesurvey".

At the bottom of the interface, there is a footer with a "Like it? Donate to LimeSurvey" button and the LimeSurvey logo. On the right side of the footer, it displays "LimeSurvey Versión 2.64.7+170404".

GRIAL Ecosystem (IX)

© Version Manager <https://gitlab.grial.eu>



The screenshot displays the GitLab interface for the Grial Ecosystem. The top navigation bar includes 'Projects', 'Groups', 'Activity', 'Milestones', and 'Snippets'. Below this, the 'Projects' section is active, showing a list of projects under 'Your projects'. The list includes project names, descriptions, and update dates. A 'New project' button is visible in the top right of the project list area.

Project Name	Description	Updated
wyred / casDocker	Ficheros para crear el contenedor del docker	updated 4 days ago
wyred / elegantchildtheme		updated a month ago
grial / soraps	Subtema de WordPress basado en Total para el proyecto SORAPS.	updated a month ago
DueroLand / dueroland		updated 4 months ago
DueroLand / spree_dueroland_theme	Tema visual para DueroLand	updated 4 months ago
wyred / platform		updated 4 months ago
Alicia García Holgado / cas-tecuida	CAS + OpenLDAP	updated 5 months ago
DueroLand / spree_dl_configuration	Extensión que centraliza toda la configuración de DueroLand	updated 11 months ago
DueroLand / spree_gdpr	GDPR compliance changes for Spree	updated 11 months ago
DueroLand / spree_stock_location_locker	An extension that allows administrators to use a certain stock location on per user basis	updated 11 months ago
DueroLand / spree_product_assembly	Spree extension adding support for product packs.	updated 11 months ago



3. Architectural pattern

3.1 Analysis of real ecosystems (I)

- The template must provide solutions to real problems of learning ecosystems in order to improve this type of technological solutions
- The analysis of several real case studies has been carried out in order to obtain a problem domain model
- The technique used to study the different ecosystems has been the analysis of Weaknesses, Threats, Strengths and Opportunities (SWOT) (Hill and Westbrook, 1997)

	ASPECTOS NEGATIVOS	ASPECTOS POSITIVOS
ORIGEN INTERNO	<p>-D-</p> <p>DEBILIDADES</p> <p>Carencias y limitaciones desfavorables propias</p>	<p>-F-</p> <p>FORTALEZAS</p> <p>Características y habilidades favorables propias</p>
ORIGEN EXTERNO	<p>-A-</p> <p>AMENAZAS</p> <p>Factores externos desfavorables</p>	<p>-O-</p> <p>OPORTUNIDADES</p> <p>Factores externos favorables</p>

3.1 Analysis of real ecosystems (II)

- © The selected case studies were developed before the start of this doctoral thesis

	2009	2010	2011	2012	2013
1. University of Salamanca	■				
2. GRIAL		■	■	■	■
3. TRAILER				■	■

3.1 Analysis of real ecosystems (III)

- Comparative analysis of the characteristics analysed in each of the selected case studies

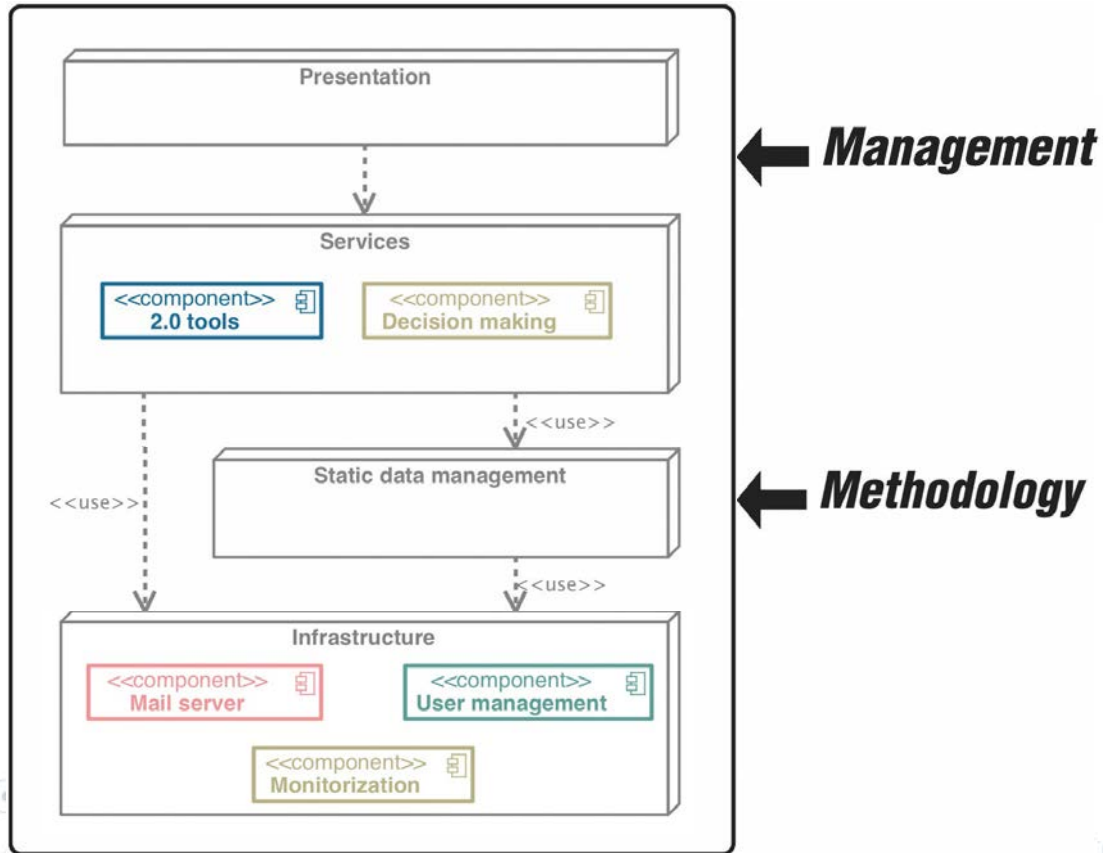
	Universidad	GRIAL	TRAILER
Methodology			
Noverlty			
Users			
Information			
Integration			
Movility			
Social			
Evolution			
Decision-making			
Re-use			
Open source			
Development			
Deployment			

3.2 Characteristics of technology ecosystems

- ◎ **Solid methodological**, project and risk management foundation
- ◎ Clear definition of the processes and workflows needed to manage the ecosystem
- ◎ **Centralised user management** of both data and authentication
- ◎ **Centralised management of static data**
- ◎ Transparent integration of components to ensure flexibility and adaptability of the system to changes, i.e. a plan for **ensuring the evolution of the ecosystem must be in place**
- ◎ Enhancement of the **reusability** of ecosystem components

- ◎ **Integration at the level of presentation** that conveys uniqueness
- ◎ Strong **social component** that allows integration with social tools
- ◎ Support for **decision-making and for the analysis of information flows**, which take place both within the ecosystem and from outside and vice versa.
- ◎ Use of **open source software** as a basis for the development of the ecosystem components in order to benefit from the advantages of this type of software
- ◎ Definition of the necessary training and immersion strategies and plans **to facilitate the acceptance of the ecosystem** by its end users

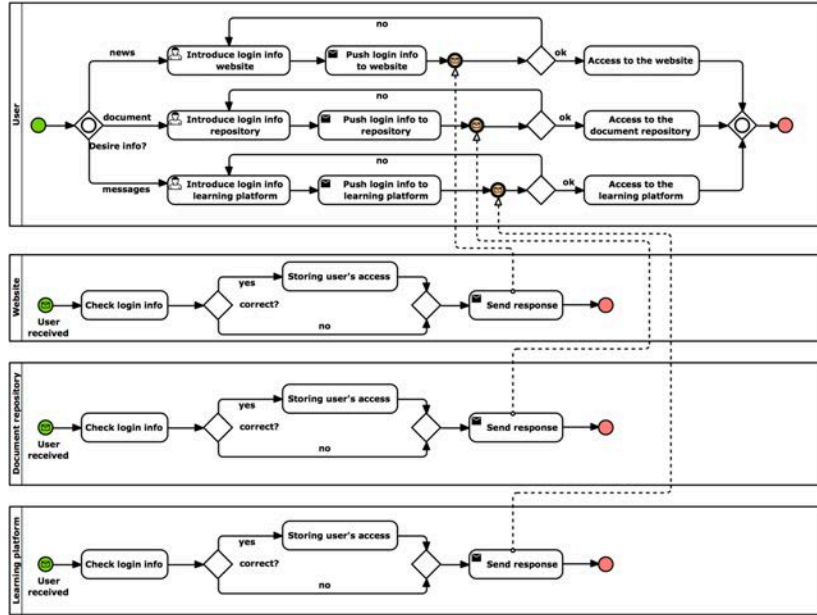
3.3 Definition of the architectural pattern



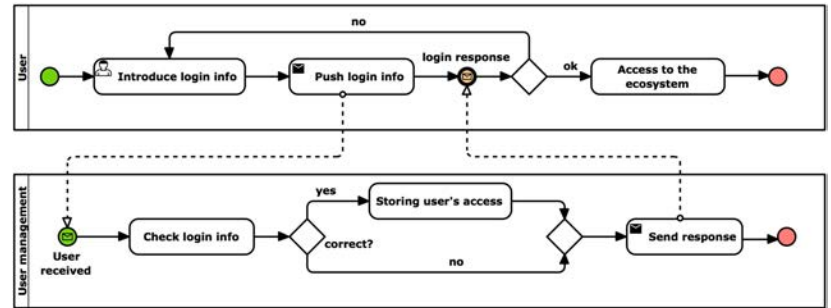
3.4 Validation of the architectural pattern (I)

- ① Although the standard is based only on the analysis of several real technological ecosystems, it is necessary to carry out a validation process
- ① The process has been divided into three phases
 - ① Problems related to similar knowledge management processes have been selected and grouped and modelled in BPMN diagrams
 - ① The same business processes have been modelled by applying the architectural pattern
 - ① The pattern has been tested in several real case studies

3.4 Validation of the architectural pattern (II)



No pattern



Applying the pattern

3.4 Validation of the architectural pattern (III)

Application of the validated pattern in real cases

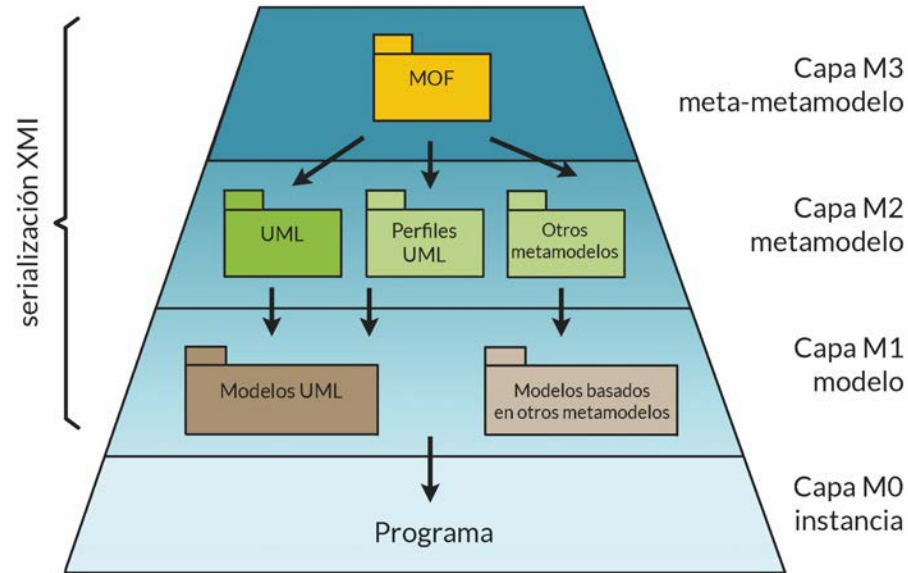
	2013	2014	2015	2016	2017	2018
1. INAP ecosystem	■	■	■	■		
2. PhD ecosystem		■	■	■	■	■
3. WYRED ecosystem					■	■

4. Metamodel

4.1 Model-driven development (I)

- ◎ There is work on modelling software ecosystems, but most approaches are not supported by a methodology that uses the standards defined by OMG
- ◎ Franco-Bedoya, Ameller, Costal and Franch (2017), as other authors (Barbosa and Alves, 2011; Sadi and Yu, 2015), state that the development of analysis and modelling techniques is one of the main challenges of open-source software ecosystems
- ◎ Model Driven Development (MDD) is a software engineering approach that involves the application of models and modelling technologies to increase the level of abstraction at which developers create and evolve software (Hailpern, 2006)
- ◎ MDA is OMG's approach to implement MDD using the set of standards for visualizing, storing and exchanging designs and software models

4.1 Model-driven development (II)



4.2 Metamodel definition (I)

- ◎ The learning ecosystem metamodel is a model of the M2 layer of the four-layer architecture, i.e. it is an instance of the MOF
- ◎ It is defined on the basis of the architectural pattern in order to model learning ecosystems that follow the pattern, so that in the process of defining the ecosystem a solution is given to the problems detected during the analyses carried out in real ecosystems
- ◎ The metamodel is a platform-independent model, i.e. a PIM (Platform-Independent Model)

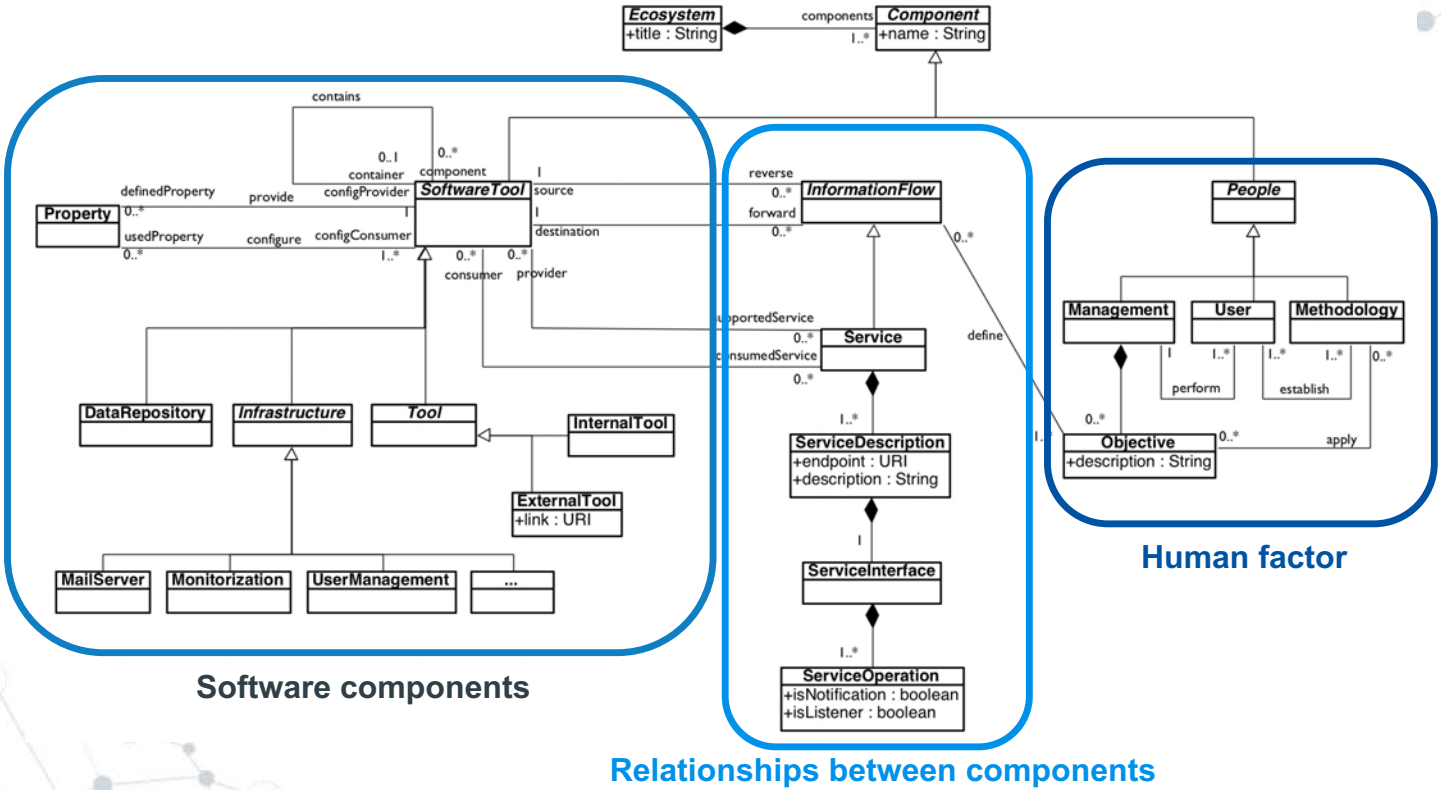
4.2 Metamodel definition (II)

- ◎ The high-level requirements of the learning ecosystem metamodel are the following (García-Holgado and García-Peñalvo, 2017)



- The metamodel will capture the high-level description of the components of the learning ecosystem
- The metamodel will capture the human factor as part of the learning ecosystem
- The metamodel shall allow capturing the information flows between the components of the learning ecosystem
- The metamodel shall allow capturing the configurations of the software components

4.2 Metamodel definition (III)



Software components

Relationships between components

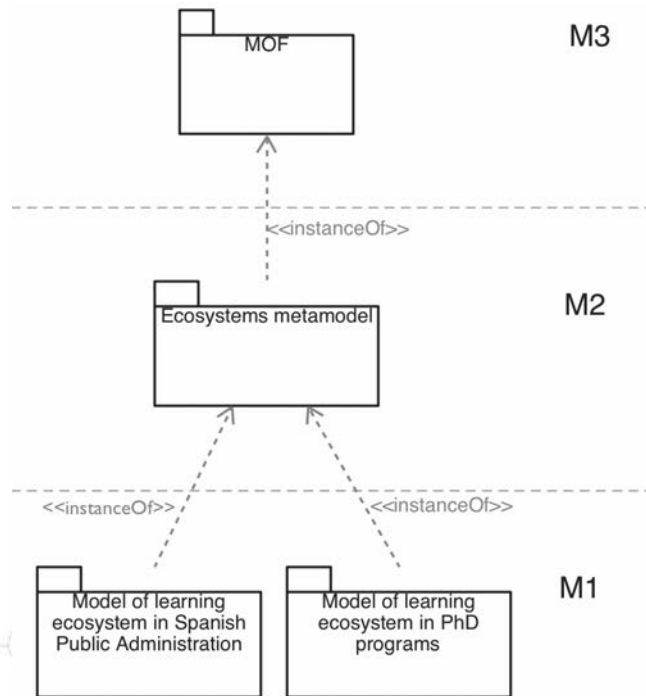
Human factor

4.2 Metamodel definition (IV)

4 OCL constraints

```
context Ecosystem inv:  
self.components -> select(c |  
c.oclIsTypeOf(MailServer)) -> size() = 1 and  
self.components -> select(c |  
c.oclIsTypeOf(Monitorization)) -> size() = 1 and  
self.components -> select(c |  
c.oclIsTypeOf(UserManagement)) -> size() = 1 and  
self.components -> select(c |  
c.oclIsTypeOf(InternalTool)) -> notEmpty and  
self.components -> select(c |  
c.oclIsTypeOf(Management)) -> notEmpty and  
self.components -> select(c |  
c.oclIsTypeOf(Methodology)) -> notEmpty and  
self.components -> select(c |  
c.oclIsTypeOf(User)) -> notEmpty
```

4.3 Case studies (I)



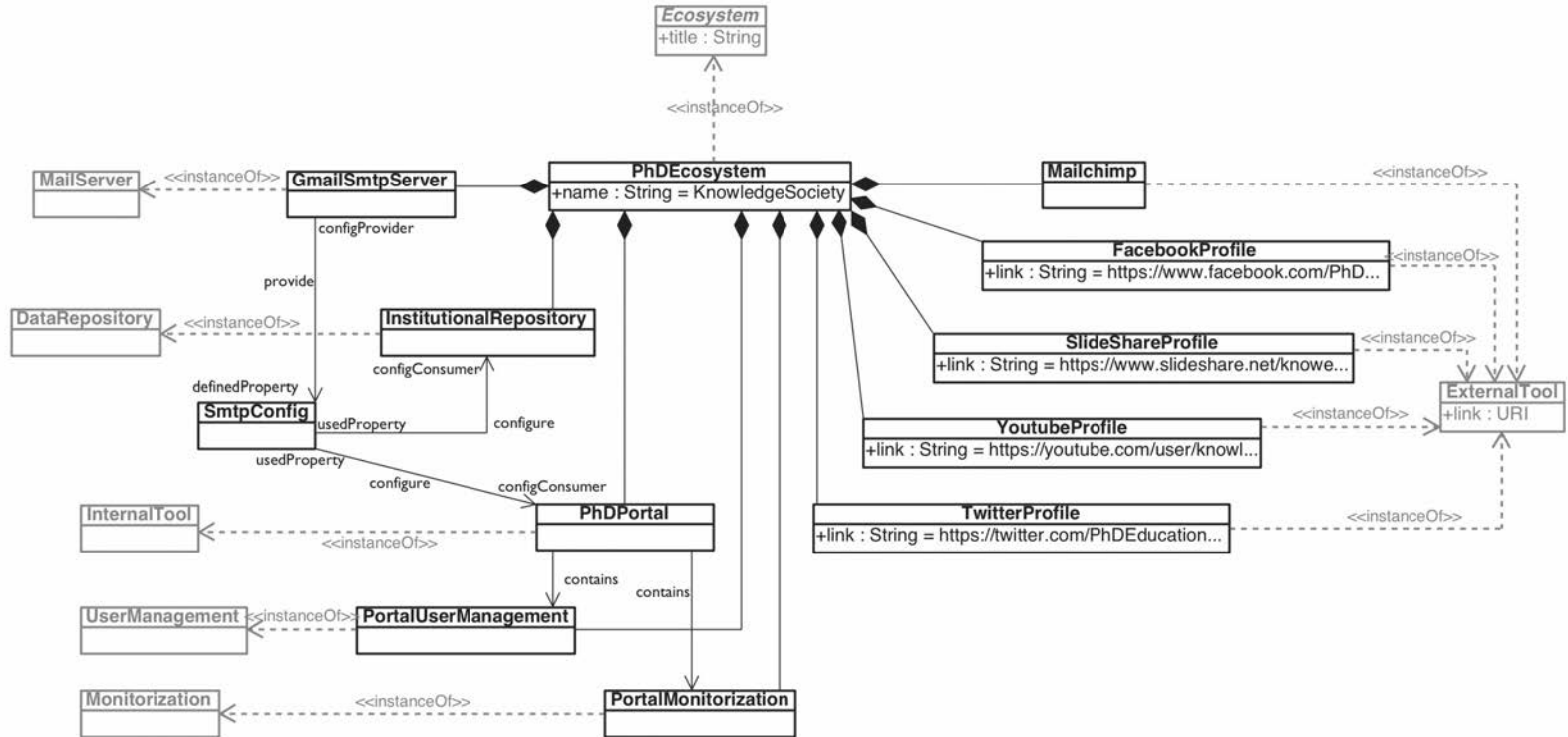
The learning ecosystem metamodel has been tested in two case studies in order to verify that it allows the definition of real learning ecosystem models



Two of the learning ecosystems used to validate the architectural pattern have been taken and their corresponding model has been defined from the metamodel

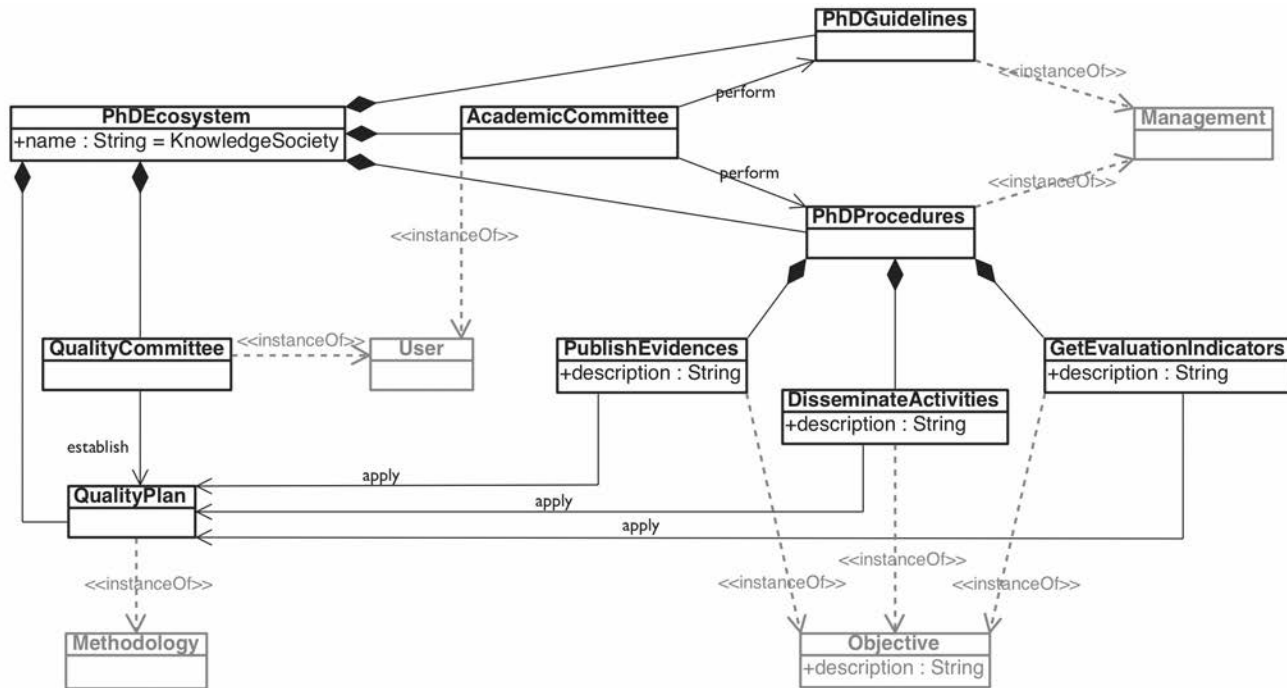
4.3 Case studies (II)

Ecosystem for Knowledge Management in a Doctoral Programme: Software Component View



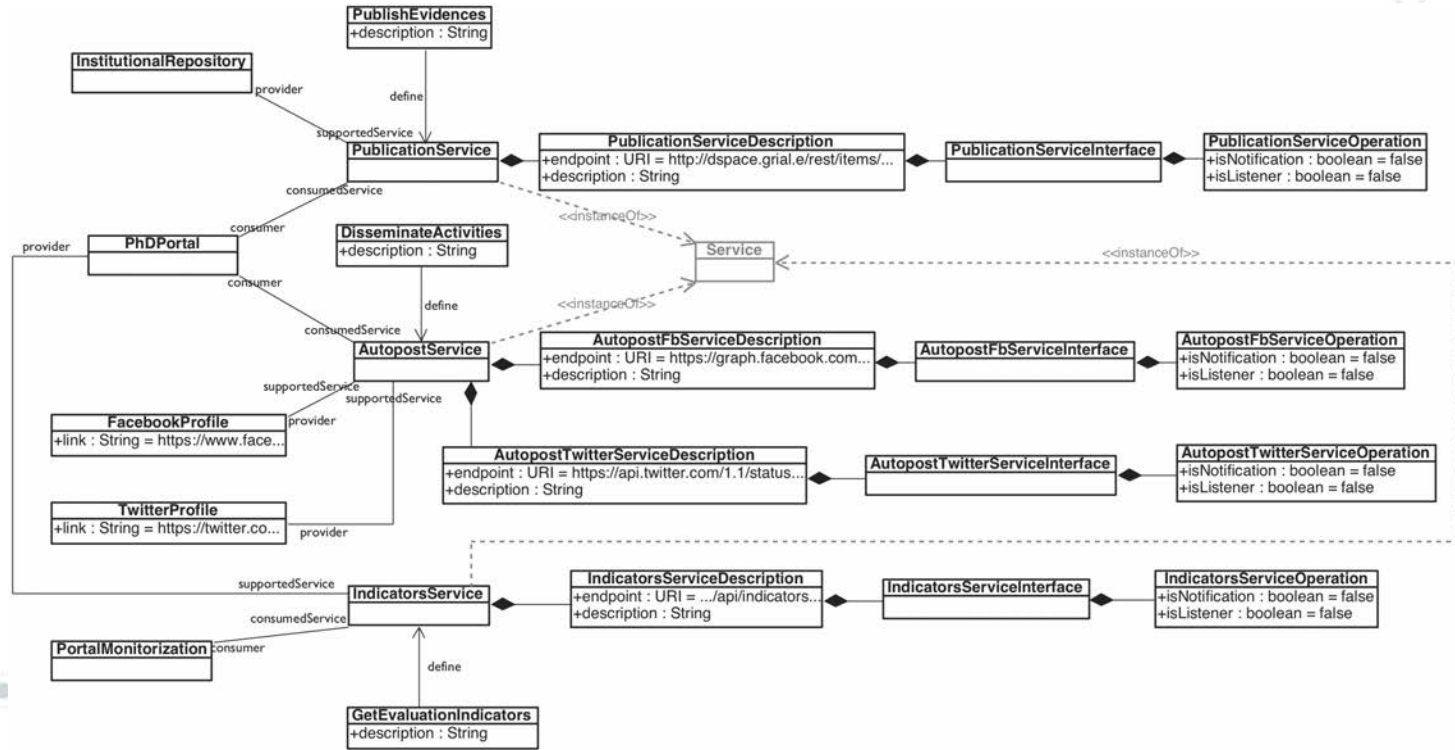
4.3 Case studies (III)

Ecosystem for Knowledge Management in a Doctoral Programme: The Human Factor View



4.3 Case studies (IV)

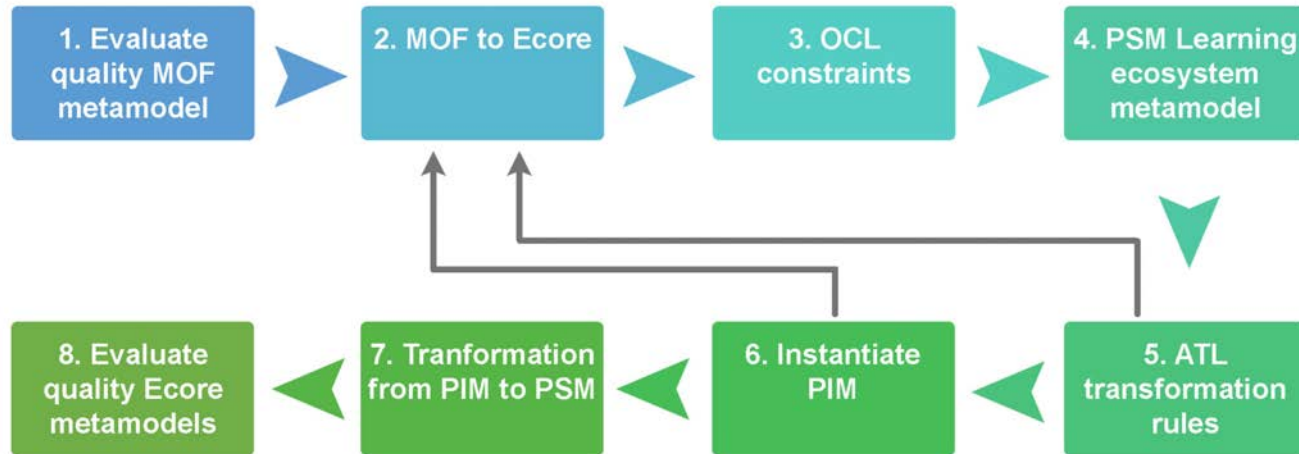
Ecosystem for Knowledge Management in a Doctoral Programme: View Relationships between Components



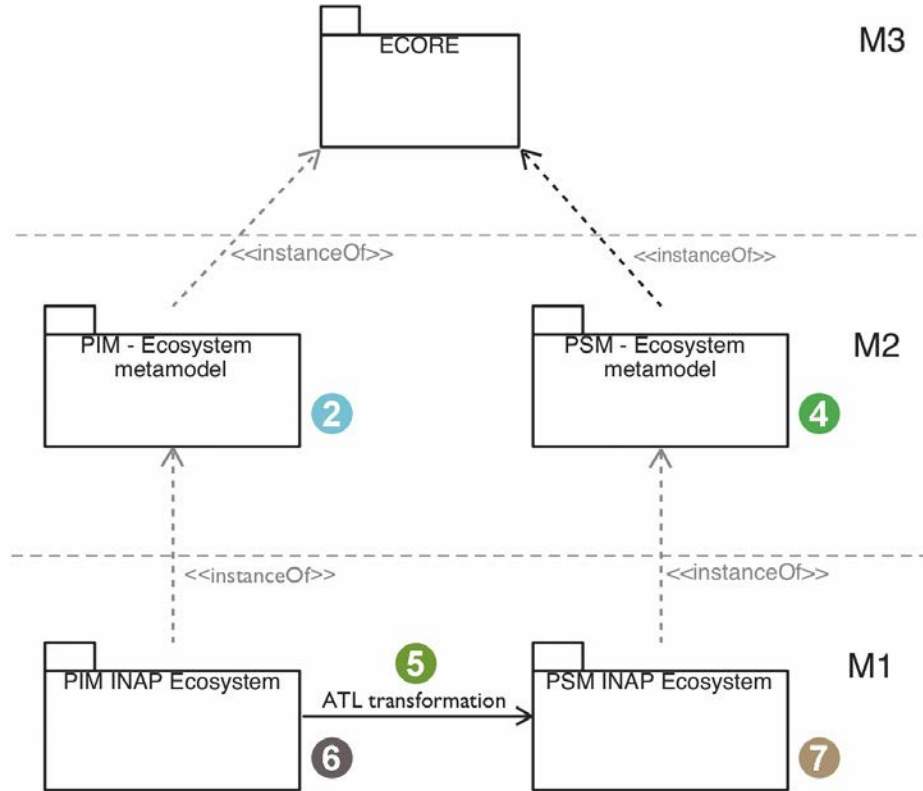
4.4 Metamodel validation (I)

- ◎ To ensure the validity of the process it is necessary that transformations between models are performed using tools rather than manually as has been done in the two case studies described in the previous section
- ◎ There are no stable tools that support the MDA standards
- ◎ Ecore and the tools provided by Eclipse have been used

4.4 Metamodel validation (I)

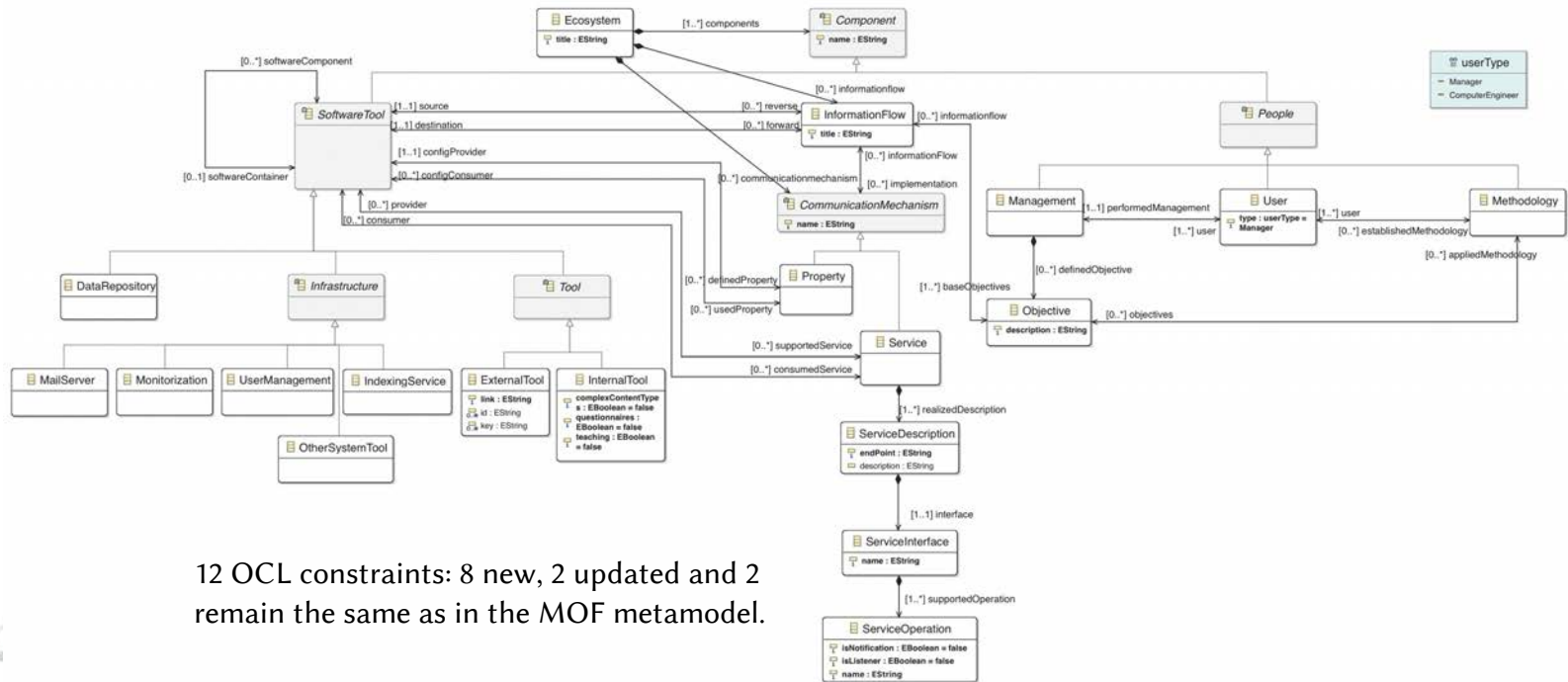


4.4 Metamodel validation (II)



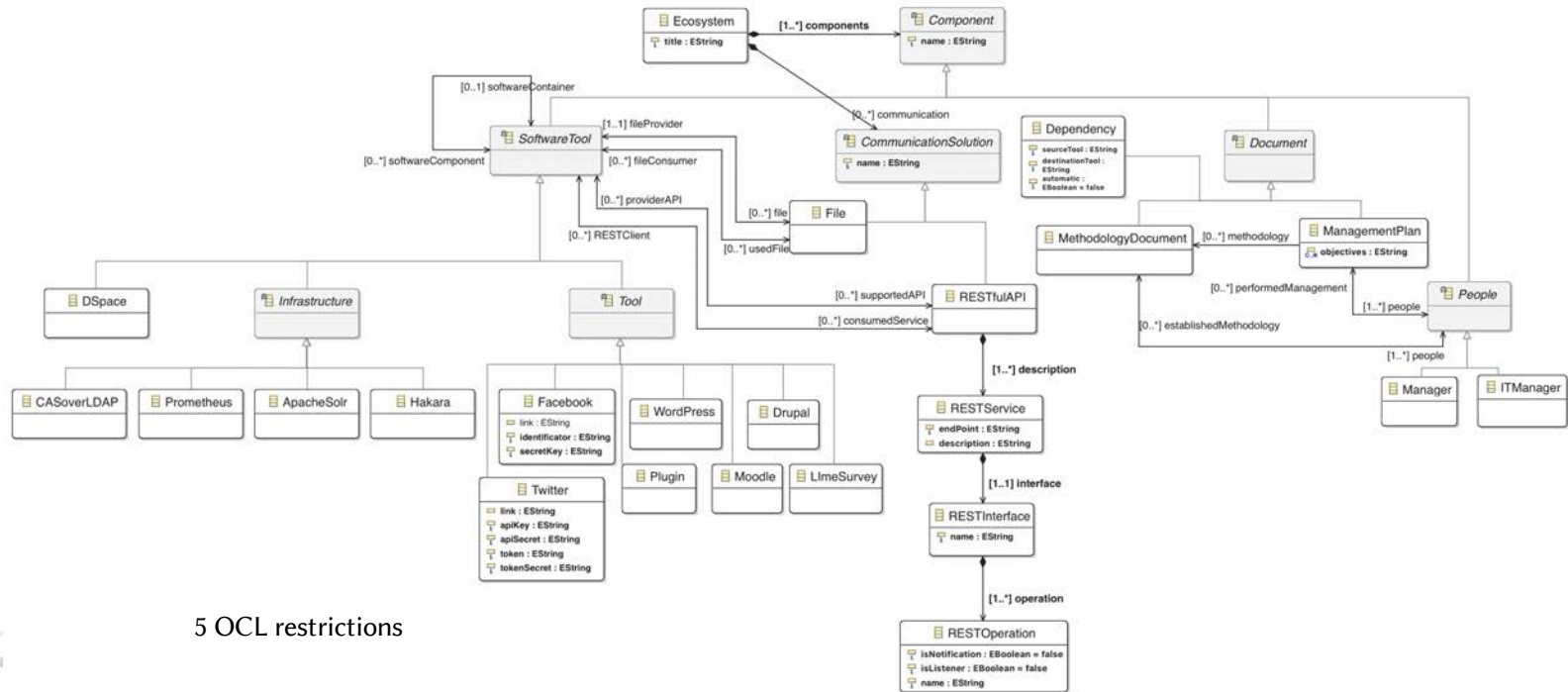
4.4 Metamodel validation (III)

Learning Ecosystem Metamodel in Ecore



4.4 Metamodel validation (IV)

Platform-specific metamodel for open source software-based learning ecosystems



4.4 Metamodel validation (V)

Transformation from PIM to PSM using ATL rules

PIM (learning ecosystem metamodel)	PSM (to define learning ecosystems)
Software tools	
Ecosystem	Ecosystem
DataRepository	Dspace
MailServer	Hakara
Monitorization	Prometheus
UserManager	CASoverLDAP
IndexingService	ApacheSolr
InternalTool	Moodle
	LimeSurvey
	WordPress
	Drupal
ExternalTool	Facebook
	Twitter
SoftwareTool	Plugin

4.4 Metamodel validation (VI)

Quality of metamodels

- ① The validation process has two phases aimed at assessing the quality of the metamodels
- ① The quality assessments have been verified according to the quality framework proposed by López-Fernández, Guerra and de Lara (2014)
- ① A set of 30 features that basically correspond to syntactic rules that metamodels must follow
- ① The metamodels defined in Ecore, both the PIM and the PSM, meet all the quality criteria



5. Examples of ecosystems implementing the metamodel

5.1 INAP Ecosystem (I)



National Institute of Public Administration (INAP)

Knowledge management within the Spanish Public Administration

- training of public employees
- the selection of various Corps and Scales of public employees attached to the Ministry of Finance and Public Administrations
- and the promotion of research and studies on government and the different levels of public administration from an interdisciplinary perspective

5.1 INAP Ecosystem (II)

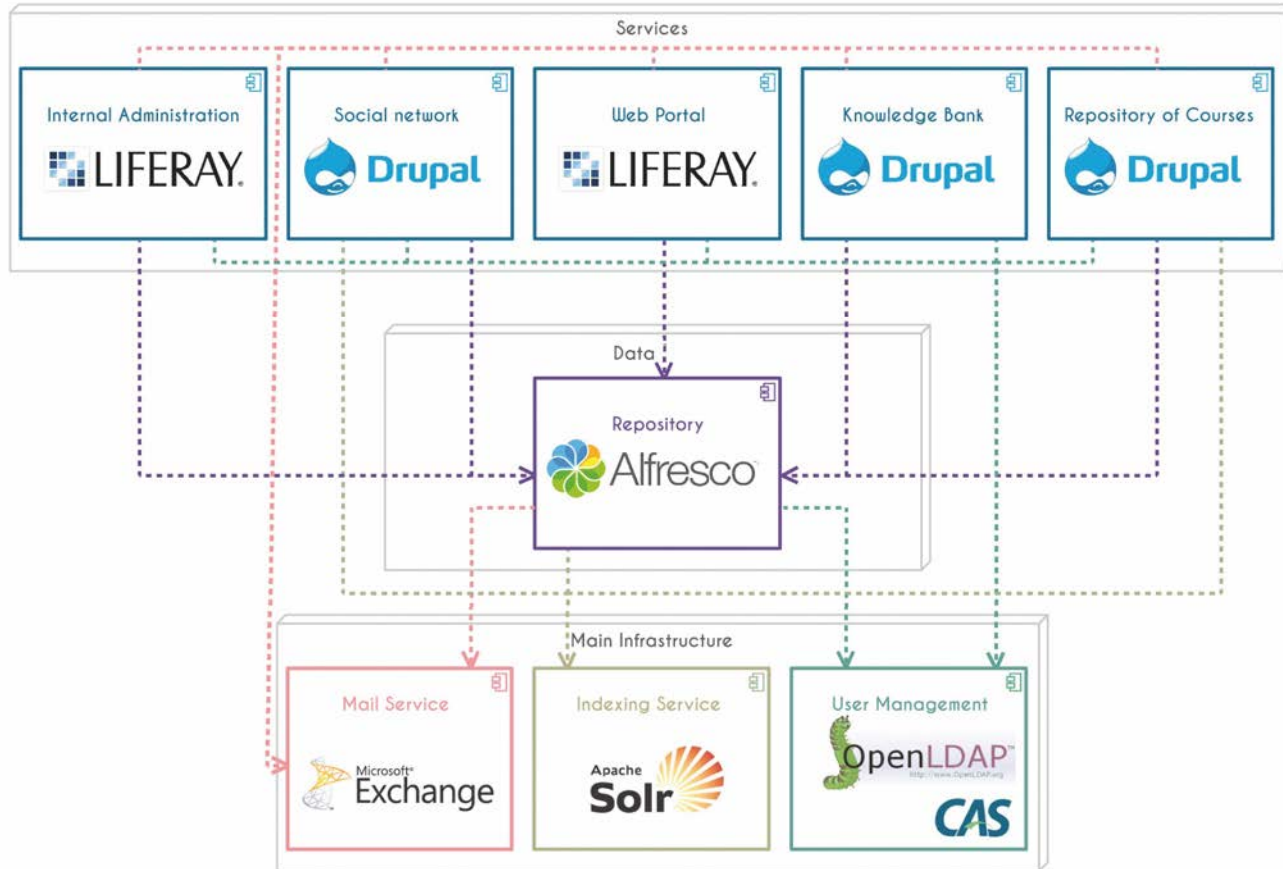


Technological ecosystem since 2012

Main objective: to generate knowledge through collaboration between employees of different public bodies.

- Create a space accessible from any public organisation without compromising information security
- Provide procedures and tools with which the user can publish some of the knowledge generated to enforce the transparency law that allows public access to government information
- Support integration with other existing tools to make all institutions and bodies part of the project and collaborate in its evolution
- Provide the user with information about other users with similar interests, promoting social learning and collaboration among users of the system
- Facilitate decision-making and the analysis of information flows in order to improve the system and adapt it to the needs of the Public Administration
- Establish information flows and mechanisms to support the four stages of the knowledge life cycle within the Spanish Public Administration: Socialisation, Externalisation, Combination, Internalisation

5.1 INAP Ecosystem (III)



5.1 INAP Ecosystem (IV)

© Public portal <http://www.inap.es>

The screenshot displays the homepage of the Instituto Nacional de Administración Pública (INAP). At the top, there is a navigation bar with multilingual greetings: "Bienvenidos", "Benvinguts", "Benvidos", "Ongi Elorri", "Welcome", and "Accueil". The INAP logo and full name are prominently displayed, along with a search bar labeled "Buscar en INAP". Below the header, a large banner features a photograph of a grand interior space with a chandelier. On the left side of the banner, there are three white buttons: "Selección", "Aprendizaje", and "Investigación y divulgación". On the right, a blue button reads "Sede Electrónica". A central graphic promotes "FORMA²" as a "Plataforma de cursos masivos on line – MOOC". Below the banner, a row of six buttons offers various services: "Conócenos", "Red Social", "Promotores de Formación", "Aprende on line", "Actividad Editorial", and "Banco de Conocimiento". Further down, a central blue button is labeled "LA ADMINISTRACIÓN AL DÍA", flanked by buttons for "MÁSTER EN DIRECCIÓN Y LIDERAZGO PÚBLICOS", "EL INAP E IBEROAMÉRICA", "PROYECTO 'COMPARTIR'", and "INNOVA". At the bottom, a partial orange button is visible, labeled "Nuevo Máster Universitario en Dirección y...".

6.1 Ecosistema del INAP (V)

🕒 Practices community <https://social.inap.es>

INAP SOCIAL

Conecta, contribuye y comparte

La Red Social Profesional de la Administración Pública

ACCESO USUARIOS

Regístrate | Recordar contraseña

Accede a la información de protección de datos y las condiciones de uso

En el caso de incidencias técnicas, diríjase a al.incidencias@inap.es

En ella encontrarás **personas afines en intereses y experiencias profesionales.**

Podrás establecer tu propia **red de contactos, participar en las comunidades** que mejor se ajusten a tu perfil y **compartir conocimiento, experiencias y oportunidades.**

INAP Social se completa con el Banco de Conocimientos más importante de la Administración al que tendrás acceso desde la propia Red.

GOBIERNO DE ESPAÑA
MINISTERIO DE POLÍTICA PÚBLICA Y ADMINISTRACIÓN LOCAL
INAP INSTITUTO NACIONAL DE ADMINISTRACIÓN PÚBLICA
INSTITUTO NACIONAL DE ADMINISTRACIÓN PÚBLICA

ADMINISTRACIÓN PÚBLICA
Copyright © 2019
Todos los derechos reservados

6.1 Ecosistema del INAP (VI)

© Institutional Knowledge Bank <https://bci.inap.es>

The screenshot displays the homepage of the BCI (Banco de conocimientos INAP). The header features the BCI logo, the text 'Banco de conocimientos INAP', and the tagline 'COLECCIONAR, CONECTAR, INNOVAR, APRENDER'. It also includes logos for the Spanish Government and the INAP (Instituto Nacional de Administración Pública), along with a search bar and a 'Buscar' button. Below the header, there is a navigation menu with 'Cómo funciona el BCI' and 'Iniciar sesión'. The main content area is titled 'Banco de conocimientos' and includes a search bar with a 'Buscar' button. Below the search bar, there is a section for 'Búsqueda por áreas temáticas' with six thematic cards: 'Círculo de conocimiento', 'Desarrollo sostenible', 'Experiencias de aprendizaje', 'Conocimiento Institucional', 'Redes de conocimiento', and 'Banco de innovación de las administraciones públicas'. On the right side, there are logos for 'INAP SOCIAL', 'Centro de Estudios Jurídicos', and 'C|E|P|C', with corresponding text: 'Red Social del INAP', 'Repertorio Jurídico-Científico del CEJ', and 'BD legislación extranjera DOCEX'. The footer contains links for 'Accesibilidad', 'Guía de navegación', 'Nota Legal', 'Acerca de BCI', and 'Contacto', along with the copyright notice '© Instituto Nacional de Administración Pública 2013'.

5.1 INAP Ecosystem (VII)

🕒 Course repository <https://compartir.inap.es>



The screenshot shows the login page for the INAP course repository. At the top left, there is a logo of a stack of books and the text "Repositorio de cursos Instituto Nacional de la Administración Pública". At the top right, there are logos for the Spanish Government, the Ministry of Territorial Policy and Public Function, and INAP. The main content area features a blue box with the following text:

Inicio de sesión

Serás redirigido a la página de acceso del INAP.

¿Has olvidado tu contraseña? Haz clic aquí

Solicitud de acceso

Si desea acceder a la aplicación puede solicitarlo al administrador de su organismo. En caso de querer darse de alta como administrador de organismo, puede solicitarlo a través del correo electrónico sal.direccion@inap.es.

On the left side of the blue box, there is an image of a pencil holder filled with various colored pencils.

At the bottom of the page, there is a dark blue footer with the text: "INSTITUTO NACIONAL DE ADMINISTRACIÓN PÚBLICA Copyright © 2019. Todos los derechos reservados. Aviso Legal".

5.2 PhD ecosystem (I)

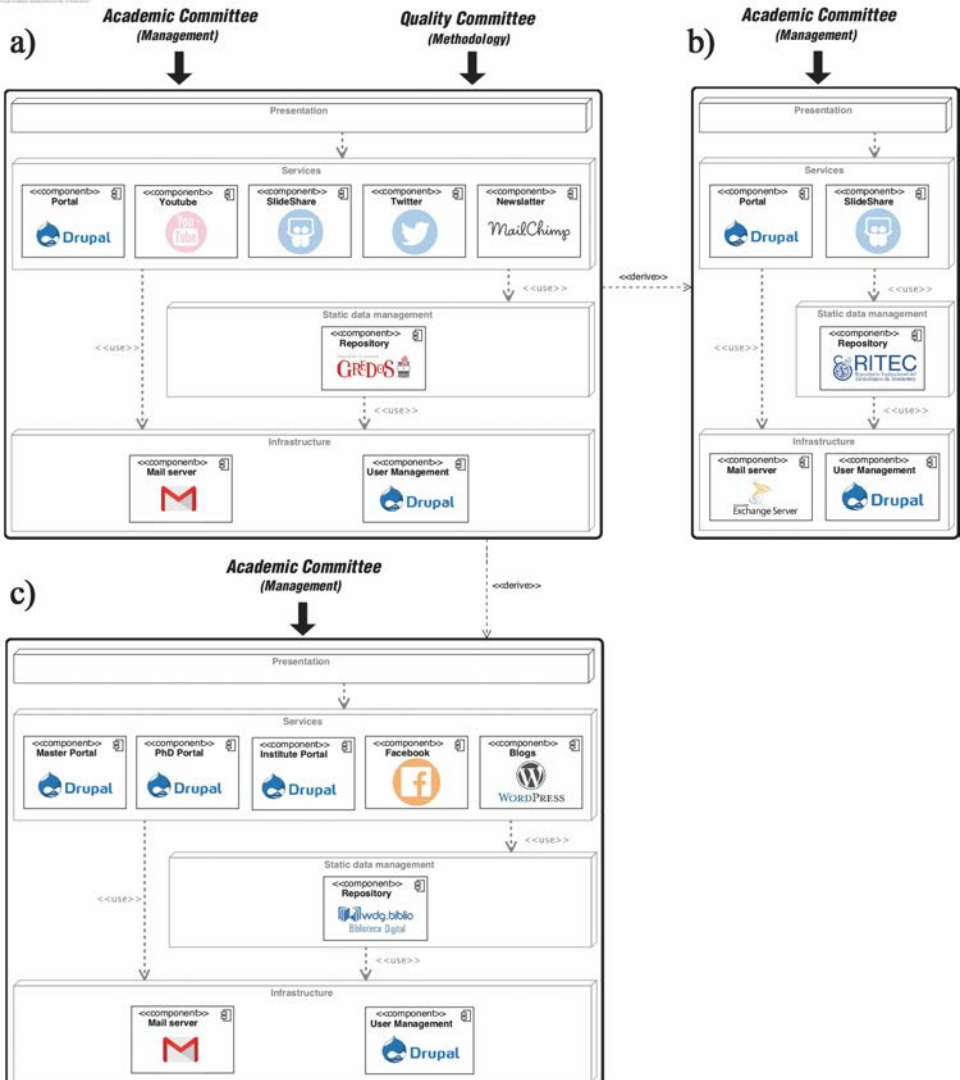
- ◎ Doctoral Programme Training in the Knowledge Society of the University of Salamanca
(<http://usal.es/webusal/node/30026>)
- ◎ Born in the University Institute of Education Sciences (IUCE - <https://iuce.usal.es>)
- ◎ To present the teaching-learning processes as authentic motors of the so-called Knowledge Society, in order to be able to discuss and generate new knowledge in this line and under a symbiosis with the most advanced technological advances



5.2 PhD ecosystem (II)

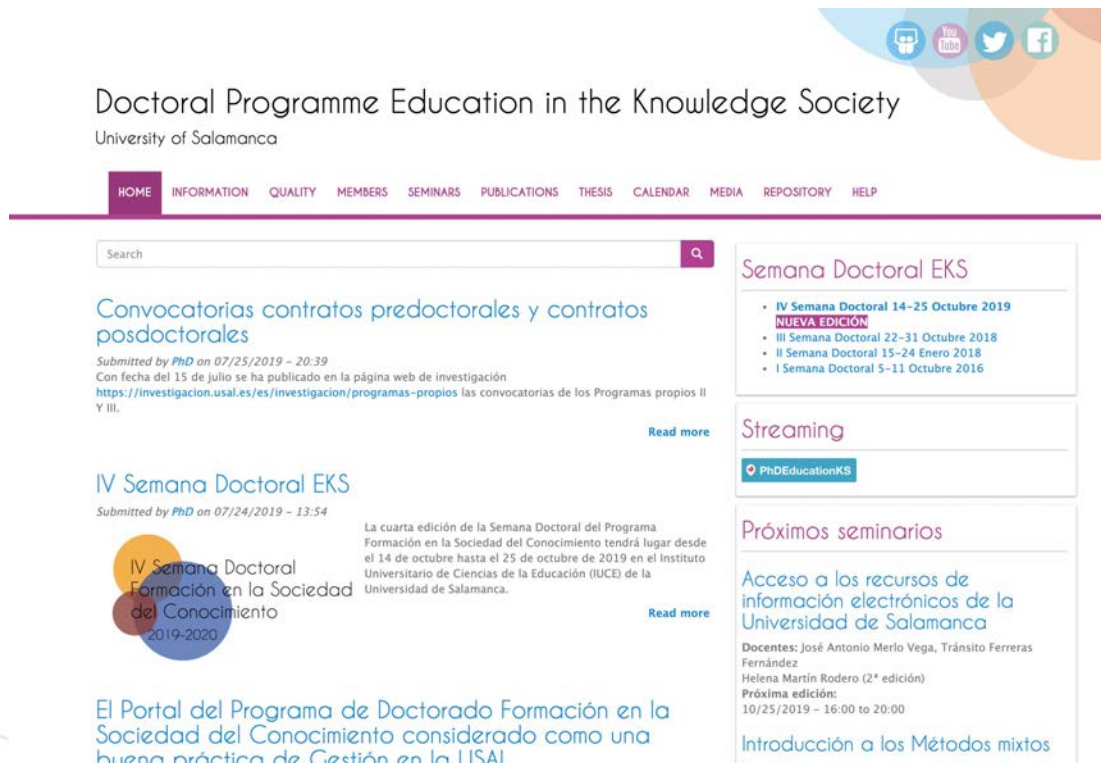
- Objectives of the technology ecosystem
 - To support the internal management of the Doctoral Programme
 - To allow the monitoring of doctoral students enrolled in the Doctoral Programme, in order to keep an updated portfolio of their progress throughout the development of their doctoral thesis
 - To provide visibility to all the knowledge generated by doctoral students as part of their training process as researchers
 - To serve as a communication channel to transmit information of interest to the members of the PhD Programme
 - To support the quality processes of the Doctoral Programme

5.2 PhD ecosystem (III)



5.2 PhD ecosystem (IV)

© PhD portal <https://knowledgesociety.usal.es>



Doctoral Programme Education in the Knowledge Society
University of Salamanca

HOME INFORMATION QUALITY MEMBERS SEMINARS PUBLICATIONS THESIS CALENDAR MEDIA REPOSITORY HELP

Search

Convocatorias contratos predoctorales y contratos posdoctorales
Submitted by PhD on 07/25/2019 - 20:39
Con fecha del 15 de julio se ha publicado en la página web de investigación <https://investigacion.usal.es/es/investigacion/programas-propios> las convocatorias de los Programas propios II y III.

Read more

IV Semana Doctoral EKS
Submitted by PhD on 07/24/2019 - 13:54
La cuarta edición de la Semana Doctoral del Programa Formación en la Sociedad del Conocimiento tendrá lugar desde el 14 de octubre hasta el 25 de octubre de 2019 en el Instituto Universitario de Ciencias de la Educación (IUCE) de la Universidad de Salamanca.

Read more

El Portal del Programa de Doctorado Formación en la Sociedad del Conocimiento considerado como una buena práctica de Gestión en la USAL.

Semana Doctoral EKS

- IV Semana Doctoral 14-25 Octubre 2019 **NUEVA EDICIÓN**
- III Semana Doctoral 22-31 Octubre 2018
- II Semana Doctoral 15-24 Enero 2018
- I Semana Doctoral 5-11 Octubre 2016

Streaming

PhDEducationKS

Próximos seminarios

Acceso a los recursos de información electrónicos de la Universidad de Salamanca

Docentes: José Antonio Merlo Vega, Tránsito Ferreras Fernández
Helena Martín Rodero (2ª edición)
Próxima edición:
10/25/2019 - 16:00 to 20:00

Introducción a los Métodos mixtos

5.2 PhD ecosystem (V)

- ◎ Tecnológico de Monterrey (Mexico)
- ◎ Doctoral Programme, specifically the Doctorate in Educational Innovation coordinated by the School of Humanities and Education
- ◎ Most of the social tools have been removed, the repository has been changed, although both are based on the same open source tool, DSpace, and the mail server has been replaced by the mail server provided by the institution

5.2 PhD ecosystem (VI)

🕒 <https://escueladehumanidades.tec.mx/dee>



The screenshot shows the top navigation bar of the website. It features the logo of Tecnológico de Monterrey on the left, followed by the text 'PROGRAMA DE DOCTORADO EN INNOVACIÓN EDUCATIVA' and 'Portafolio digital'. Below this is a horizontal menu with several items: 'INICIO', 'INFORMACIÓN', 'MIEMBROS' (which is highlighted with a dark blue background), 'NOTICIAS', 'SEMINARIOS', 'TESIS', 'PUBLICACIONES', 'EVIDENCIAS', 'CALENDARIO', 'REPOSITORIO', and 'COMENTARIOS'.

Inicio / Miembros

Miembros

Recursos gráficos

Directora del programa del DEE



Katherina Gallardo Córdova (Directora)

Coordinadora del programa del DEE



Marisol Martínez Adame (Coordinadora)

Profesores del claustro académico



5.2 PhD ecosystem (VII)

⦿ <http://escueladehumanidades.tec.mx/deh/>



**Tecnológico
de Monterrey**

PROGRAMA DE DOCTORADO EN ESTUDIOS HUMANÍSTICOS

INICIO INFORMACIÓN MIEMBROS NOTICIAS SEMINARIOS EVIDENCIAS PUBLICACIONES TESIS CALENDARIO REPOSITORIO
COMENTARIOS

Conferencia "Derechos humanos y procesos de detención de migrantes en la frontera sur de México: un análisis de la burocracia y las políticas migratorias"

ENVIADO POR JESÚS ALBERTO SALAS CORTÉS (MTY) EL 9 JUNIO 2018 - 20:49

Con: Aletia Fernández de la Reguera Ahedo

14 de junio

16:00 horas

Edificio CEDES piso 1 sala 2

Grupos de Investigación



[Leer más](#)

Conferencia: "Del Talmud a Shakespeare y de regreso: la esencialidad del estudio de las humanidades en el siglo XXI."

ENVIADO POR JESÚS ALBERTO SALAS CORTÉS (MTY) EL 8 JUNIO 2018 - 00:01

Con: Israel Diamant

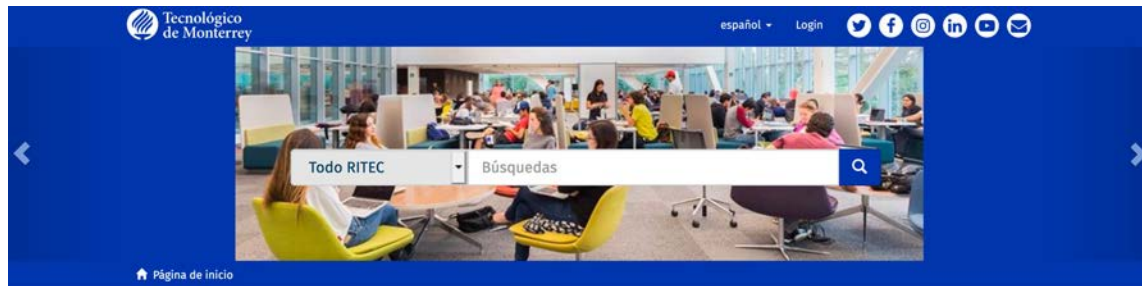
Miércoles 13 de junio

16:00 horas

Edificio CEDES piso 1 sala 2

5.2 PhD ecosystem (VIII)

© <https://repositorio.tec.mx>



- Enviar Tesis
- Carta de autorización
- Infográfico
- Guía Rápida

Listar

Todo RITEC

Mi cuenta

Acceder

Descubre

Autor

Materia

Tipo

Formato

Repositorio Institucional del Tecnológico de Monterrey

El Repositorio Institucional del Tecnológico de Monterrey (RITEC) preserva, organiza y garantiza la visibilidad y acceso a la producción científica, los recursos y objetos de aprendizaje generados por la comunidad académica de la Institución. Así como el patrimonio documental y artístico que se encuentra bajo su resguardo y que está disponible en Acceso Abierto.

Comunidades en RITEC

Elija una comunidad para listar sus colecciones

Institucional

Novus

Patrimonio Cultural

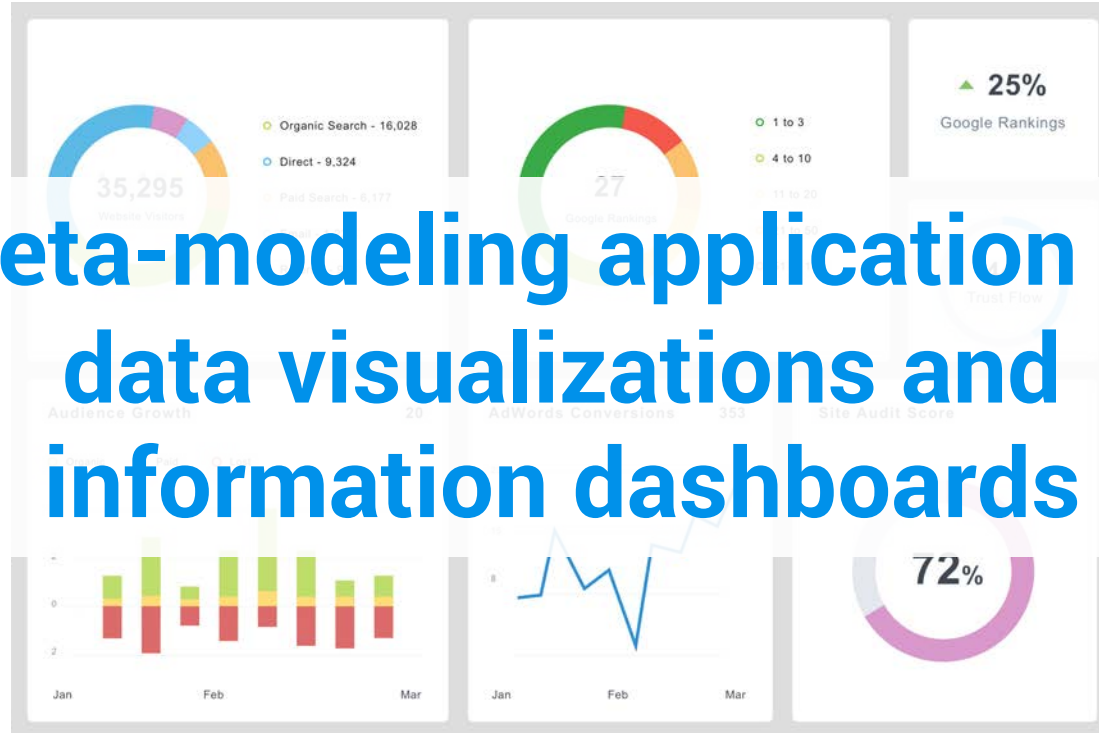
Producción Académica

Producción Científica

Tesis

Añadido Recientemente

Meta-modeling application on data visualizations and information dashboards



Hi!

I'm Andrea Vázquez Ingelmo

Computer Science PhD student
Researcher/Developer at GRIAL Research
Group

andreavazquez@usal.es

[@and_v_i](#)



Outline

- ◎ Dashboards and data visualization
- ◎ Building the meta-model
 - Domain engineering
- ◎ The complete meta-model
- ◎ Dashboards generation
 - Software product lines
- ◎ Applications



1. **Dashboards and data visualizations**

Motivation

Visualizations



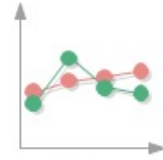
Pie



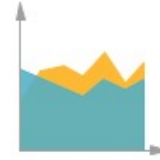
Bar



Column



Line



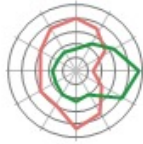
Area



Doughnut



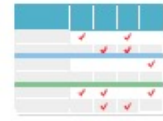
Bubble Chart



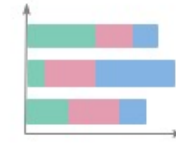
Spider and Radar



Scatter



Comparison Chart



Stacked bar chart



Gauges

Visualizations



pie chart



venn diagram



concentric diagram



circular chart



bubble chart



bubble race chart



line chart



area chart



scatter plot



sunburst chart



fan chart



windrose chart



bar chart



tape diagram



gantt diagram



tree map



grid



periodic table



arc diagram



sankey chart



chord chart



radar chart



polar grid



spiral graph



timeline



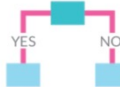
flow chart



binary tree



mind map



decision tree



block scheme

Dashboards

What Do We Talk About When We Talk About Dashboards?

Alper Sarikaya, Michael Correll, Lyn Bartram, Melanie Tory, and Danyel Fisher

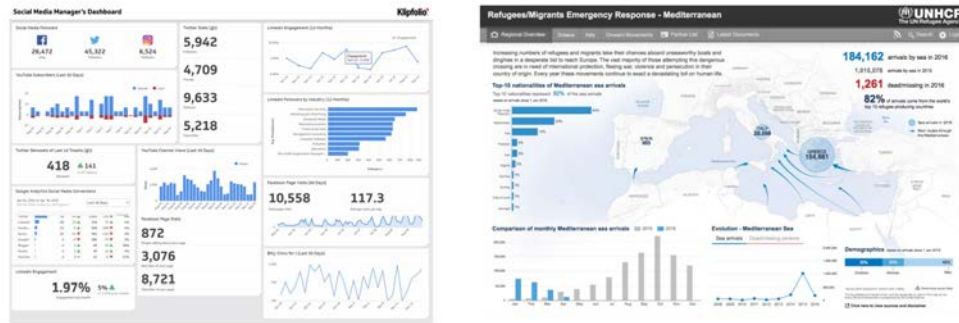


Fig. 1: Klipfolio's Social Media Manager Dashboard (DB065 from our example corpus, left) is a traditional dashboard, with large numbers representing key metrics, and tiled graphs of real-time data. The UNCHR Refugees/Migrants Emergency Response dashboard (DB117, right) also is a juxtaposition of key metrics and simple visualizations, but includes annotations and guided narrative elements. Are both dashboards? Do design principles meant for one transfer to the other?

Abstract—Dashboards are one of the most common use cases for data visualization, and their design and contexts of use are considerably different from exploratory visualization tools. In this paper, we look at the broad scope of how dashboards are used in practice through an analysis of dashboard examples and documentation about their use. We systematically review the literature surrounding dashboard use, construct a design space for dashboards, and identify major dashboard types. We characterize dashboards by their design goals, levels of interaction, and the practices around them. Our framework and literature review suggest a number of fruitful research directions to better support dashboard design, implementation, and use.

Index Terms—Dashboards, literature review, survey, design space, open coding



Dashboards



Fig. 4: Exemplar dashboards selected from our seven derived clusters. Clusters **1** and **5** demonstrate dashboards specifically targeting decision-making, while clusters **3** and **4** target awareness on behalf of the consumer. Cluster **2** targets the somewhat novel quantified self and scenario (smart-home dashboard), while **6** represents dashboards tailored for general-purpose communication. Cluster **7** captures some novel extensions to traditional dashboards.

Data visualization

COMPLEXITY

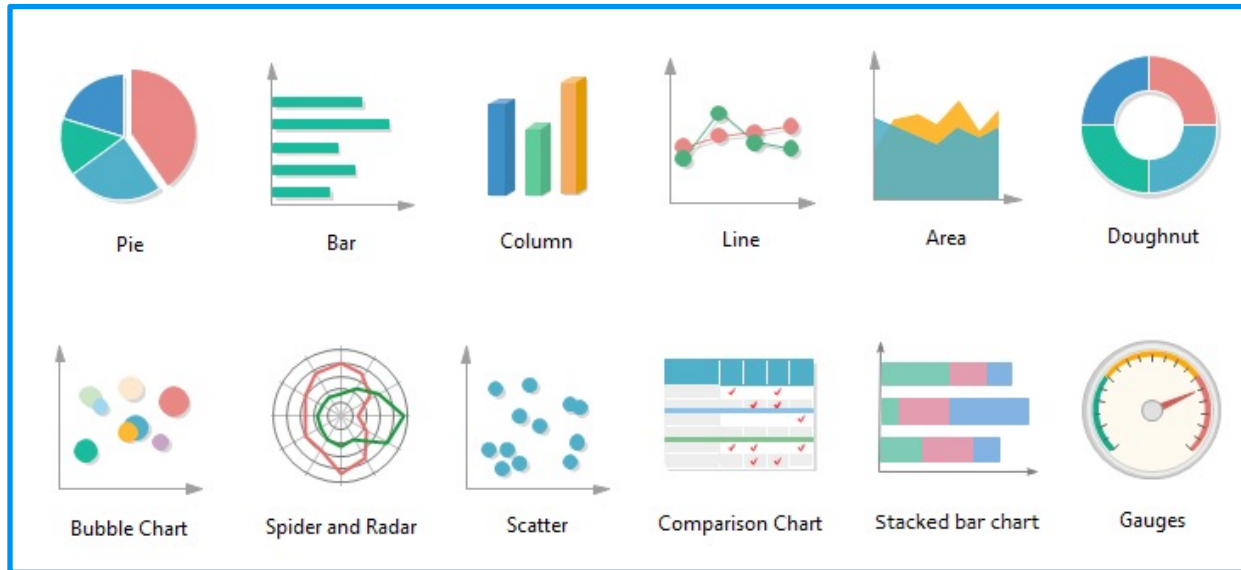
Design
decision
Tasks
Interaction
Aesthetics
Data sources
Target audience



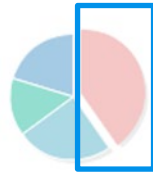
**However, we find
commonalities within variety**



Data



Visual marks



Pie



Bar



Column



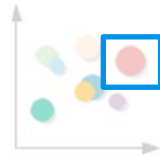
Line



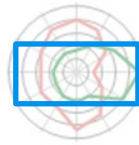
Area



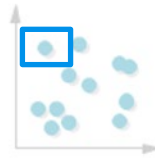
Doughnut



Bubble Chart



Spider and Radar



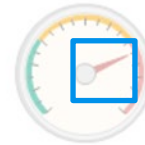
Scatter



Comparison Chart



Stacked bar chart



Gauges

Scales



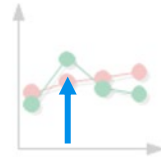
Pie



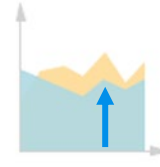
Bar



Column



Line



Area



Doughnut



Bubble Chart



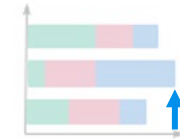
Spider and Radar



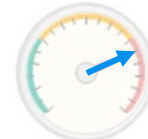
Scatter



Comparison Chart



Stacked bar chart




Gauges



**Feature abstraction to obtain
a generic “skeleton”**



- 
- ↓ Development times
 - ↑ Design decisions traceability
 - ↑ Product customization
 - ↑ Code reusability
 - ↑ Flexibility

A decorative network diagram in the top-left corner, consisting of various sized grey circles (nodes) connected by thin grey lines (edges). Some nodes are solid grey, while others are hollow circles with a grey outline. The network is dense and irregular, extending from the top-left towards the center of the page.

How?



2.

Building the meta-model

Domain engineering



Domain engineering

Categorize and identify common components or features within a domain


Goal: reuse domain knowledge to produce new software products

Domain

Google dashboards

Q Todo Imágenes Noticias Videos Shopping Más Ajustes Herramientas

tableau google kibana analytics google analytics excel ventas powerbi microsoft elastic ejemplos sal



Plantillas Dashboard Para Gest...
clicdata.com

Qué es un panel y cómo se abre? - Power BI | ...
docs.microsoft.com

Plantilla de paneles de ventas y ejemplos de KPI...
clicdata.com

Dashboard de Kibana | Elastic
elastic.co

Plantillas de cuadros de mandos financieros y...
clicdata.com

El Dashboard Ideal para tu Empresa <3 Beabloo @
beabloo.com

Que dashboards não podem faltar na sua empresa?
multipers.igpeers.com

Visualiza los datos de tu empresa con...
noveca.es

Qué es un dashboard y para qué se usa? (2021)
cyberclick.es

Las 5 mejores herramientas de dashboards de...
cyberclick.es

Dashboard | Kibana Guide [7.12] | Elastic
elastic.co

KPIs de marketing y plantillas de...
clicdata.com

Dashboard de gestión de redes | Software de monitoreo de r...
managengine.com

Un dashboard en tiempo real basado en PHP y Bootstr...
academy.lernewsb.com

Qué es un dashboard de negocios y cuáles sus benefi...
www.marketing.com

Como Armar un Dashboard Impresionante y Sencillo en E...
youtube.com

Dashboards everywhere - Jorge Nova - Medium
yorchova.medium.com

Live WooCommerce orders, reviews and st...
october.com

Qué es Dashboard - Definición, signi...
simetrica.com

Tipos de dashboard o cuadros de mando | Ejem...
staraboo.zuvs.vision

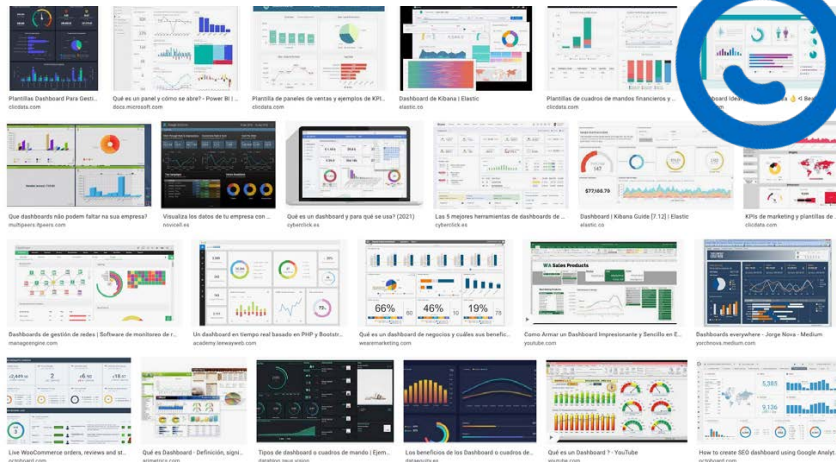
Los beneficios de los Dashboard o cuadros de...
datasecurity.es

Qué es un Dashboard? - YouTube
youtube.com

How to create SEO dashboard using Google Analy...
octogard.com

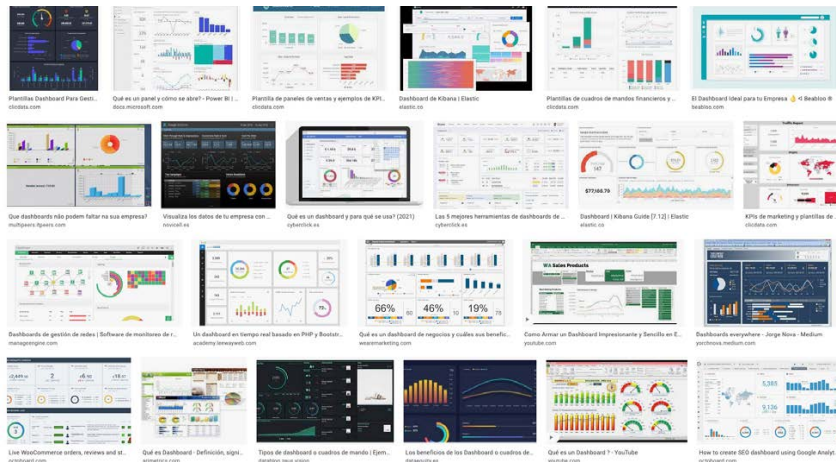
Domain

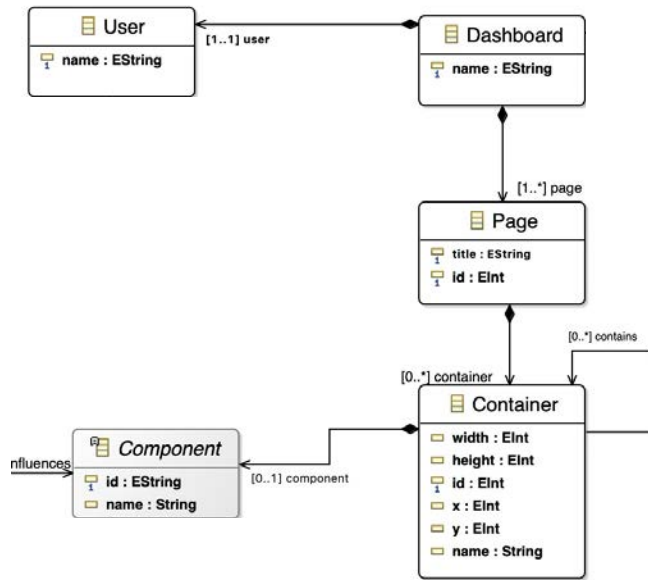
Searching for abstract and technology-independent features



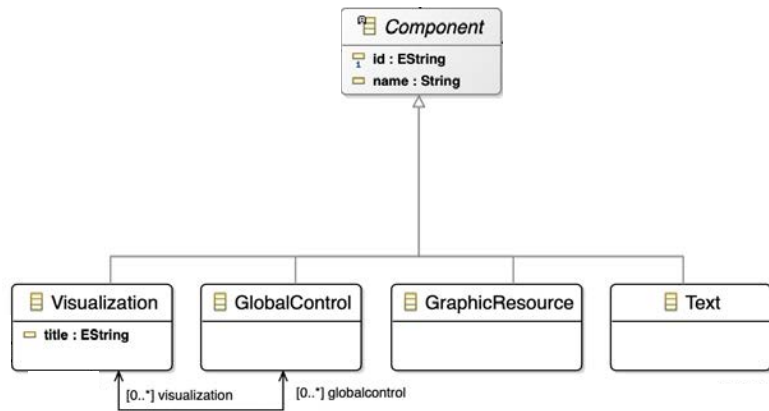
Commonalities

- Users
- Data sources
- Pages
- Containers
- Components
 - Visualizations
 - Resources
 - Controls
 - Interactivity



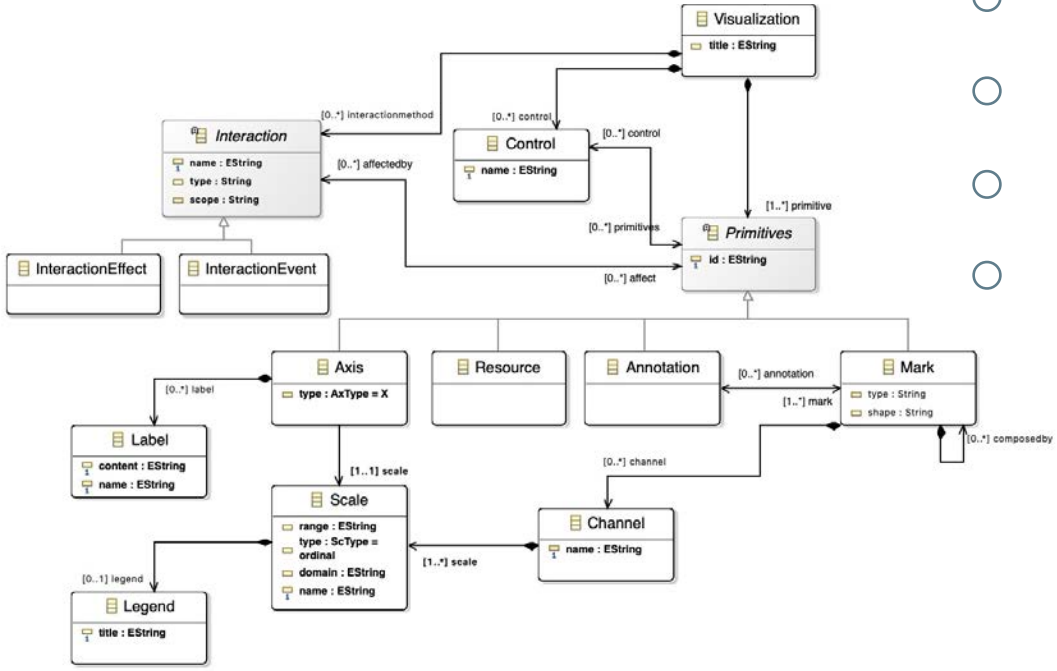


- Users
- Pages
- Containers
- Components

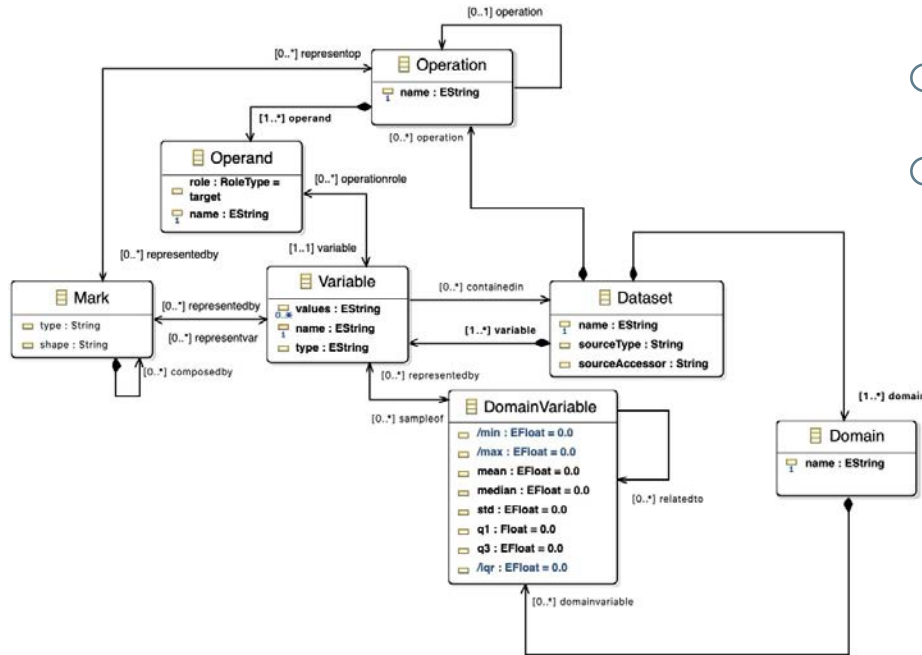


- Components
 - Visualizations
 - Controls
 - Resources
 - Text

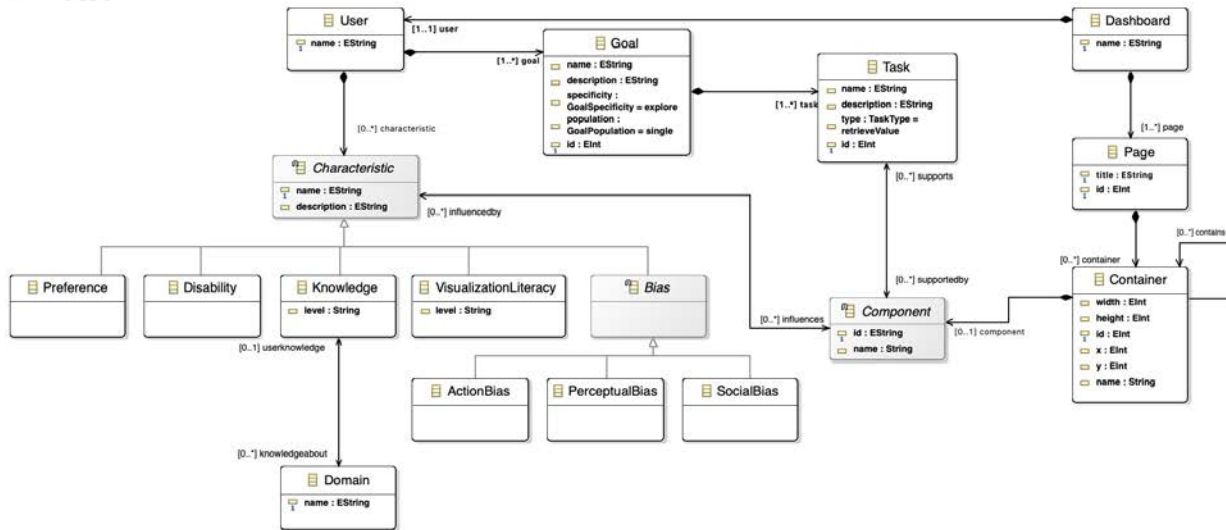
- Visualizations
 - Annotations
 - Marks
 - Axes
 - Scales
 - Channels (color, position, etc.)
 - Interaction



- Data
 - Datasets
 - Data domain
 - Variables
 - Operations



- Users
 - Characteristics
 - Goals
 - Analytical tasks

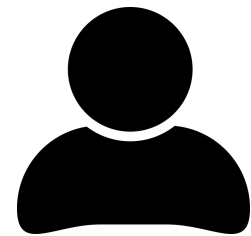
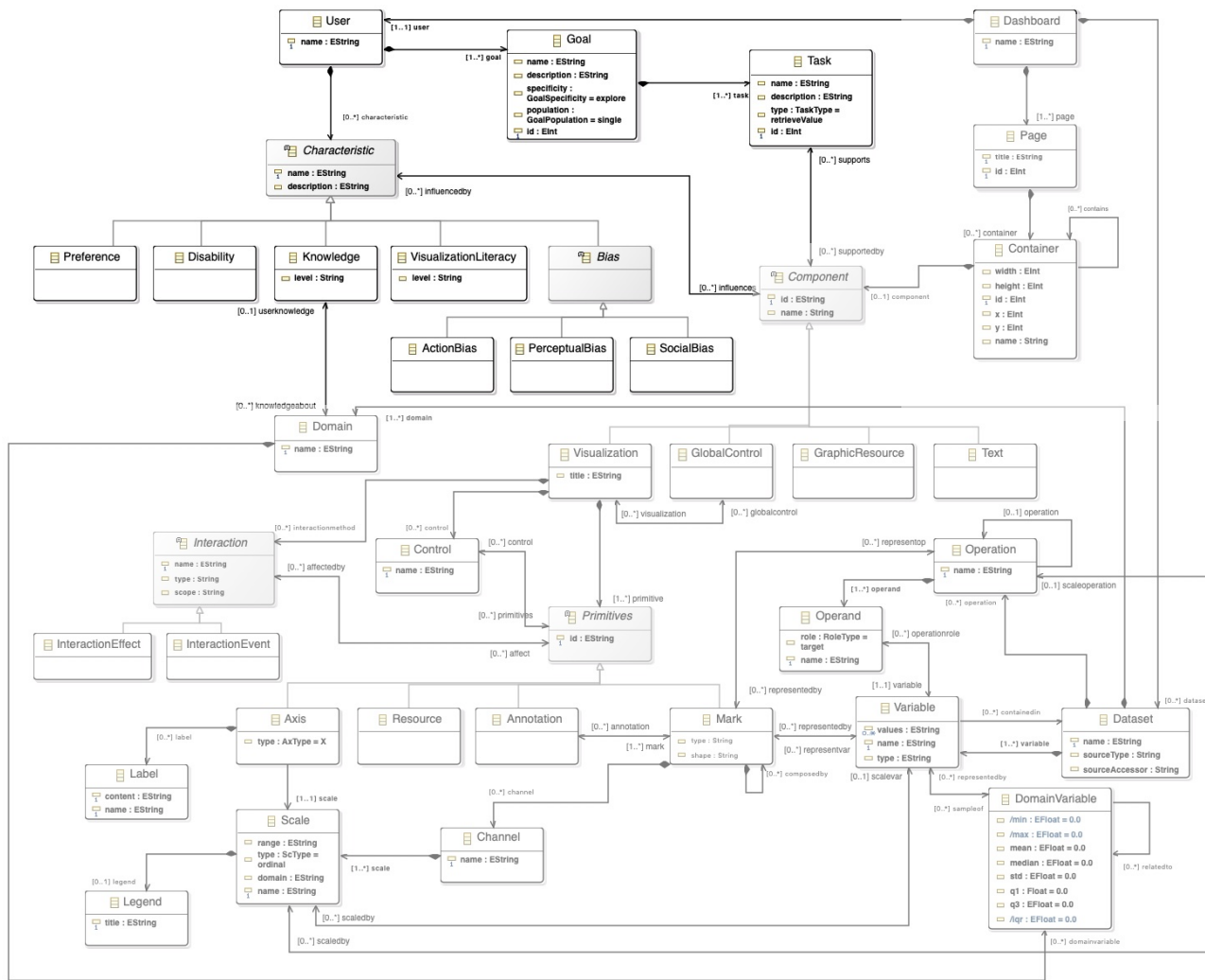


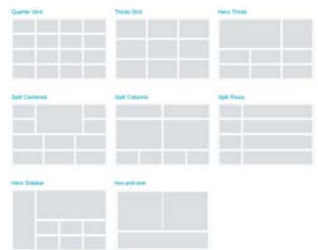
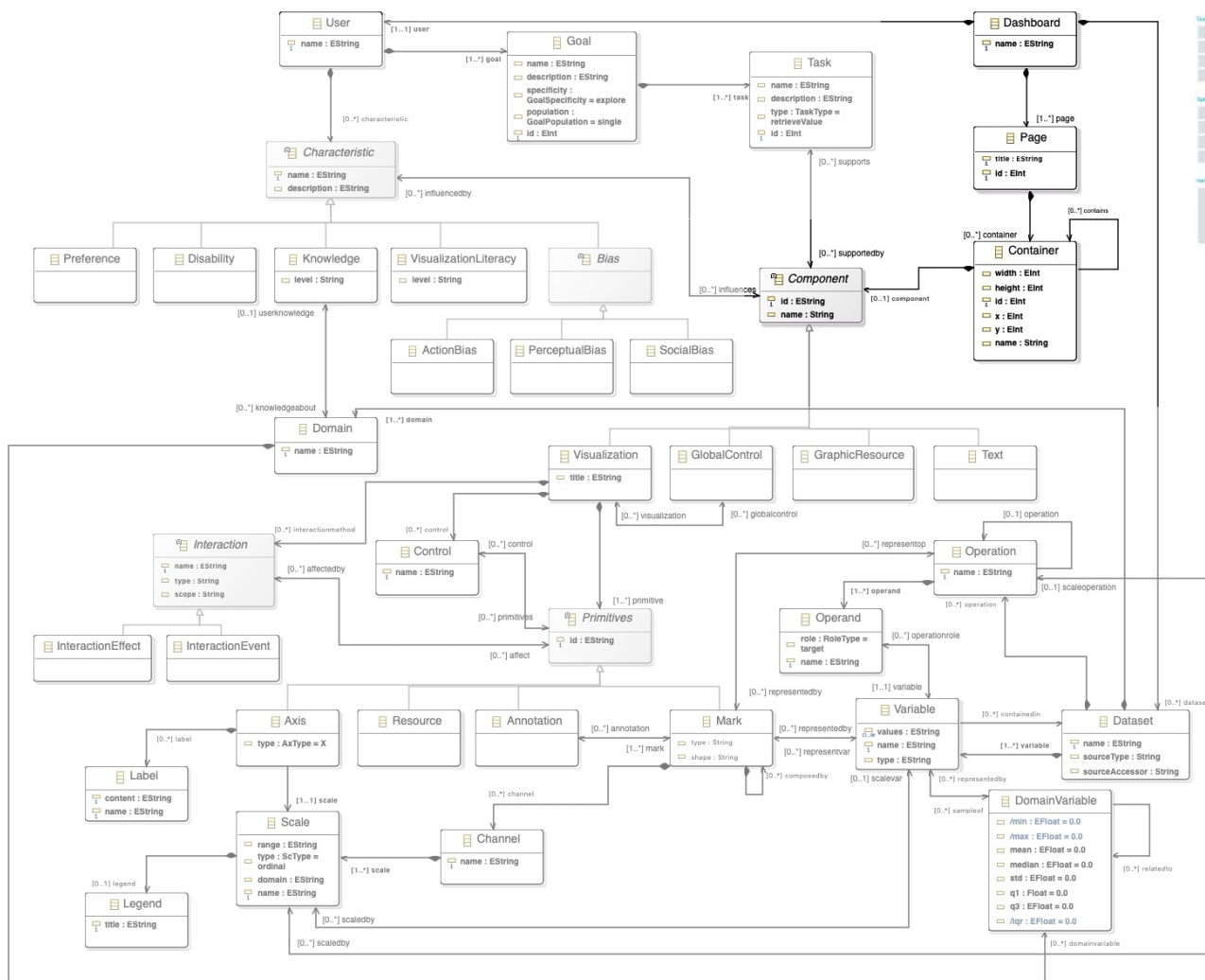
A decorative network diagram in the top-left corner, consisting of various sized nodes (some solid grey, some hollow white) connected by thin grey lines, forming a complex web-like structure.

3.

Meta-model

Final product





A decorative network diagram in the top-left corner, consisting of various sized grey circles (nodes) connected by thin grey lines (edges). Some nodes are solid grey, while others are hollow circles with a grey outline. The connections form a complex, interconnected web.

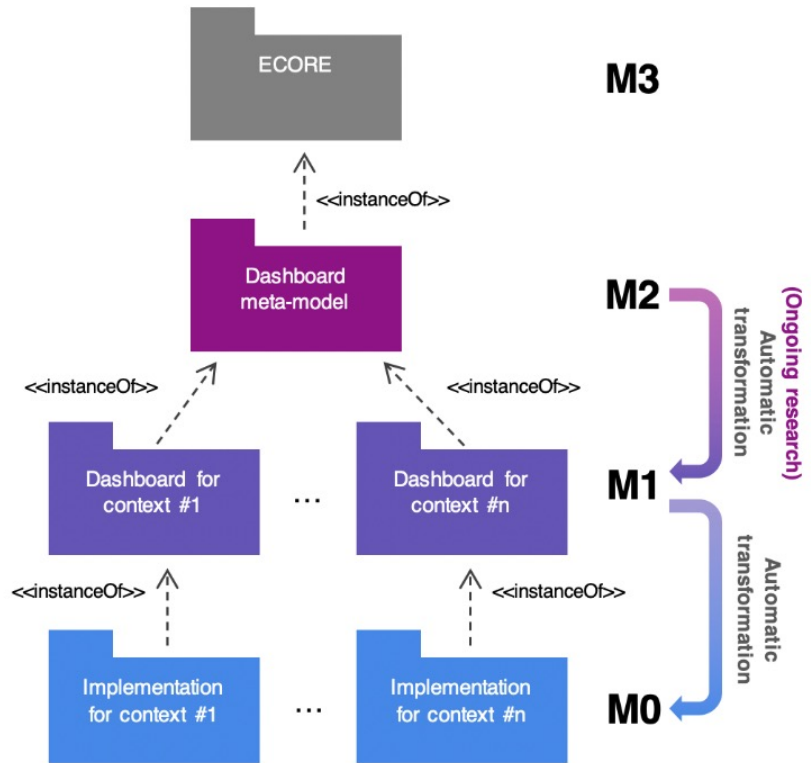
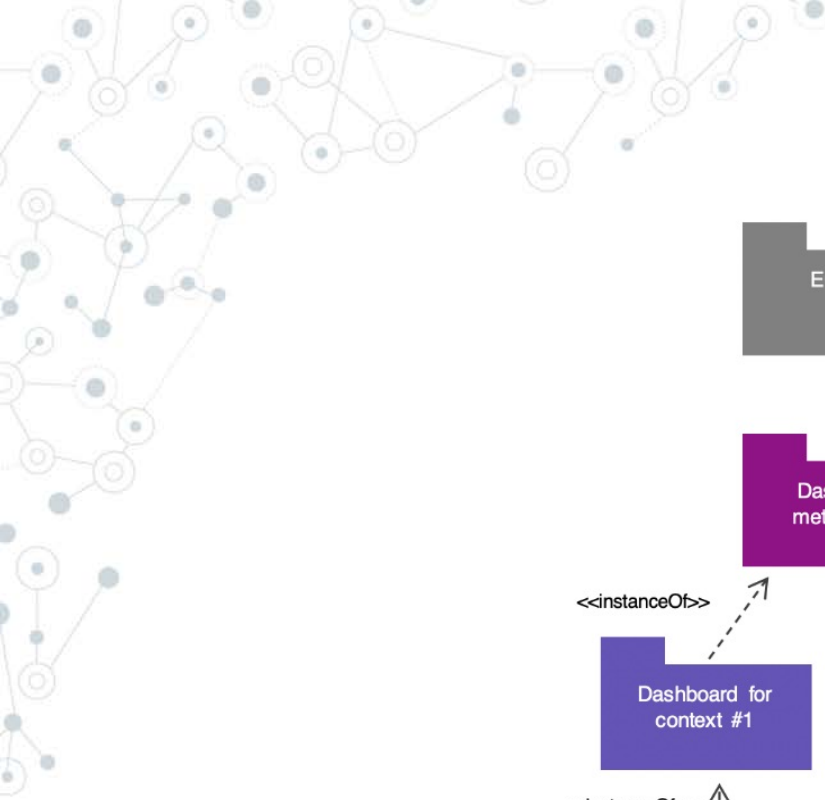
Now what?

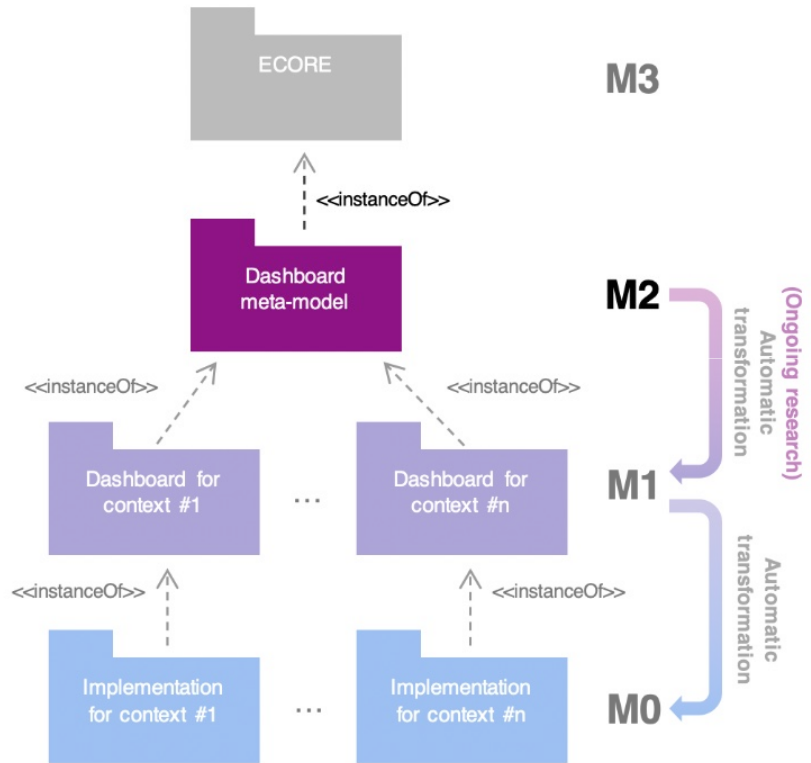
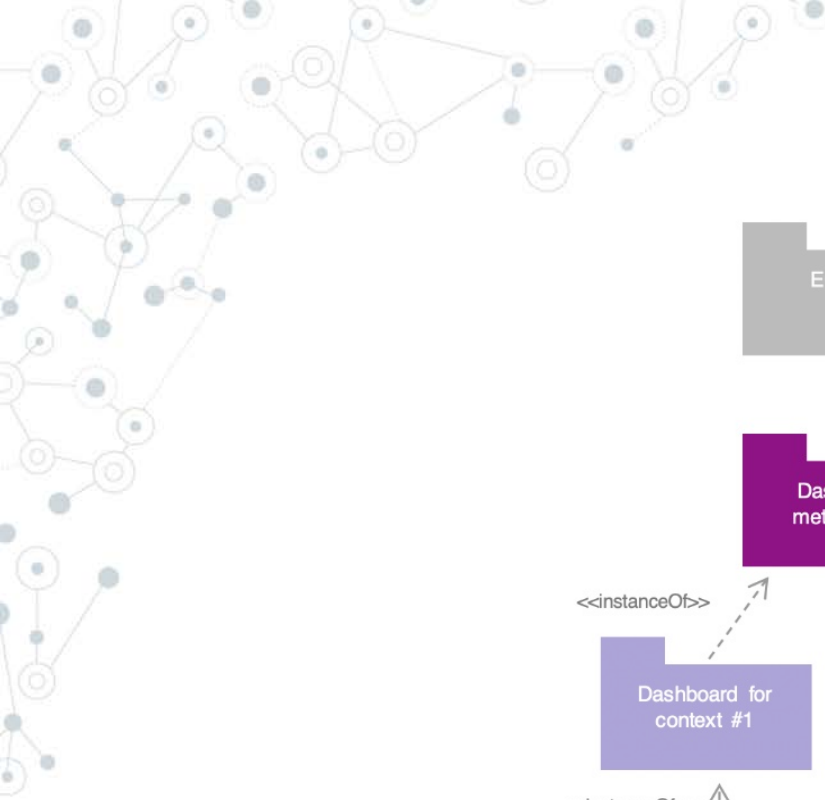


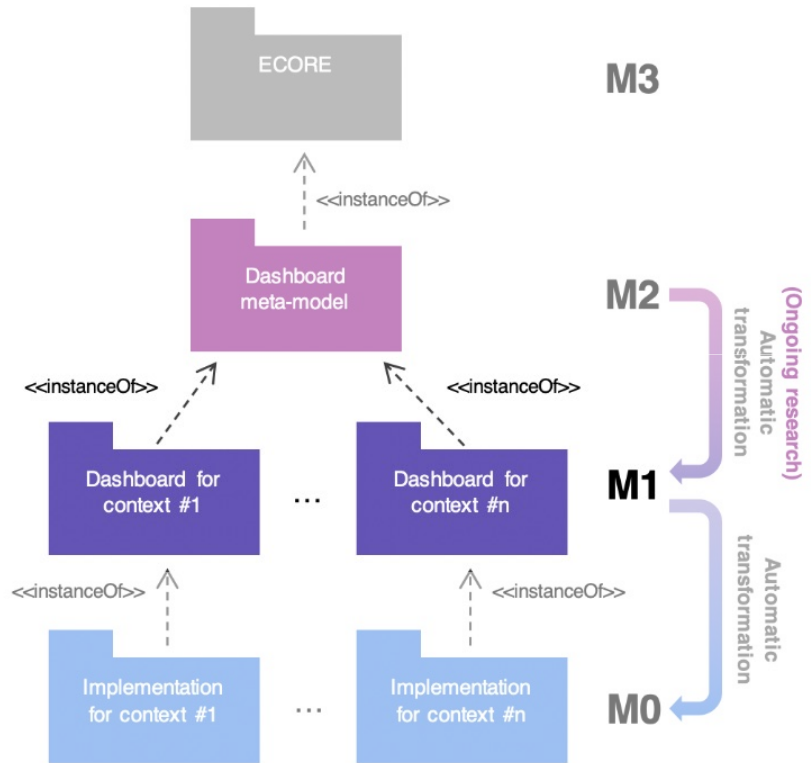
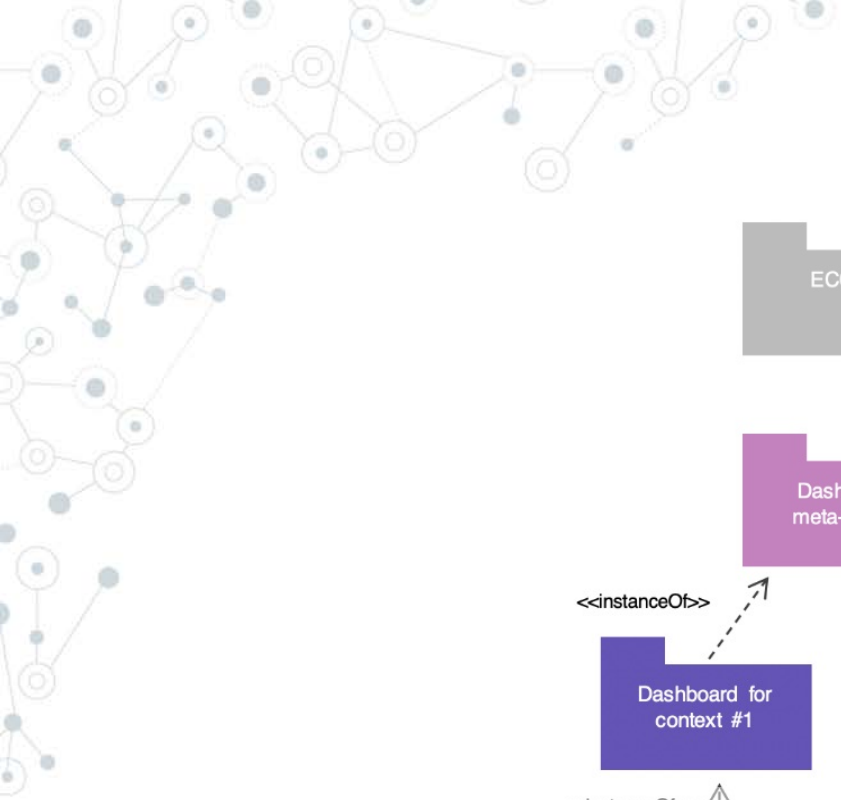
4.

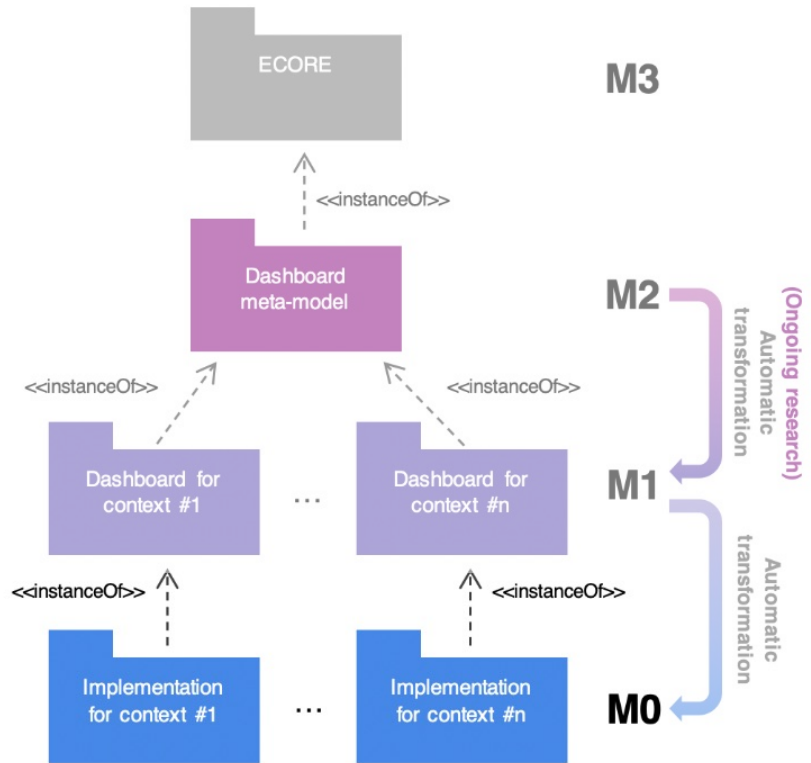
Dashboards generation

Software product lines









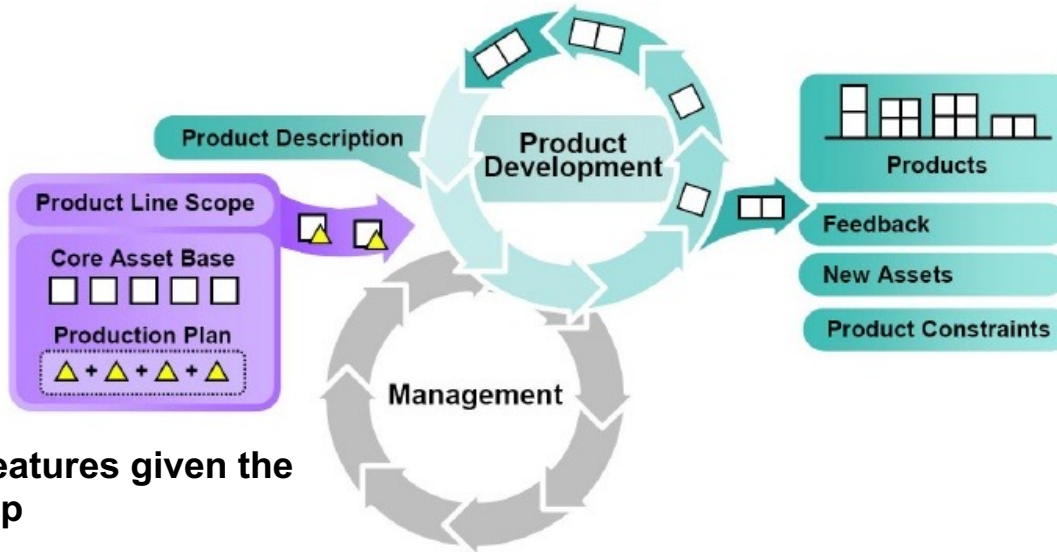


Software product lines

Systematic reuse of software assets to build new products belonging to the same family

Goal: reduce development times and costs

Generation of a customized product

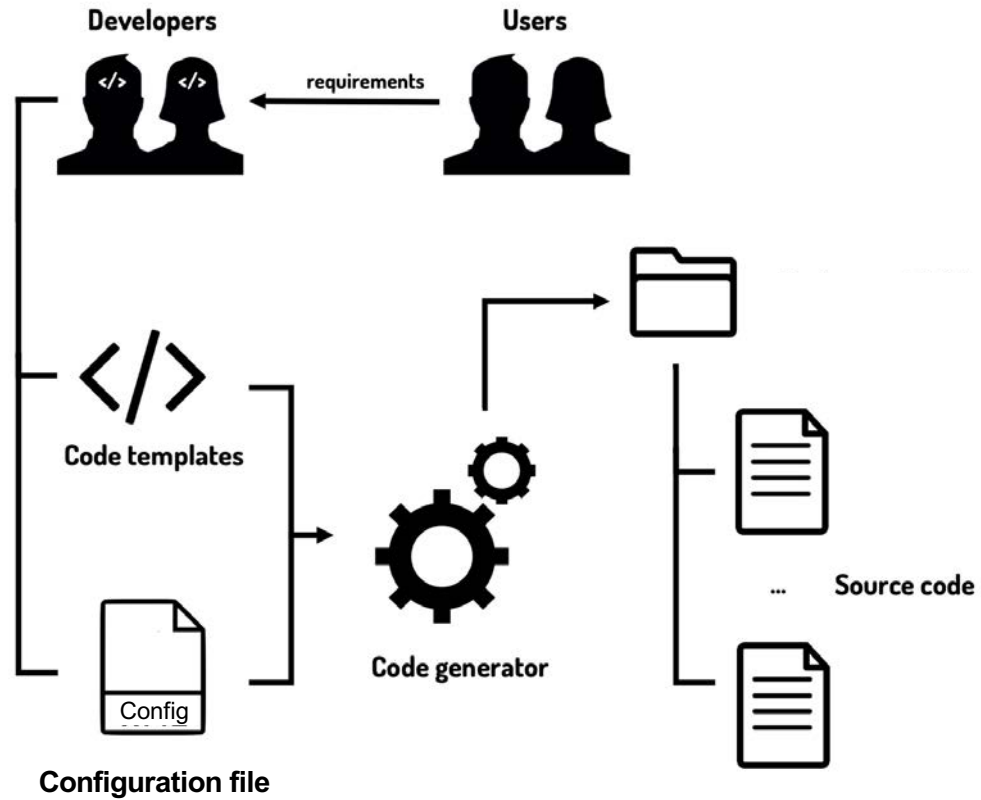


Selection of the features given the product to develop



Variability points

- Core assets based on the meta-model
- Feature specification through configuration files
- Code generation through code templates



Macros call

```
{{ global_reference.variable_definition() }}  
{{ zoom_functionality.zoom_variable_definition('xScale', 'yScale', 'xAxis',  
'yAxis', 'xLineVal', 'yLineVal', 'vis_id') }}
```

Base code

```
function my(selection) {
```

```
  selection.each(function () {  
    var tooltipScatterDiagram = d3.select("body").append("div")  
      .attr("class", "tooltip")  
      .attr("id", "compare-tooltip")  
      .style("display", "none")  
      .style("opacity", 0);
```

```
    {{ chart_title.render_chart_title() }}  
    {{ control_bar.render_control_bar() }}  
    {{ render_structure.render_component_structure() }}  
    {{ control_panel.render_control_panel('query_handler', 'vis_id') }}  
    {{ export_functionality.export() }}  
    {{ overview_tooltip.create_overview_tooltip('vis_id') }}  
    {{ axis_functionality.render_axis_handlers('xText', 'yText', 'vis_id') }}
```

```
    xScale = d3.scaleLinear()  
      .range([0, width]);
```

```
    yScale = d3.scaleLinear()  
      .range([height, 0]);
```

```
    rScale = d3.scaleLog()  
      .range([10, radius]);
```

```
    if (typeof x_min === 'undefined') {
```

```
{% macro export() %}  
{% if Component|check('Exportation') == 'True' %}  
d3.select("#save-{{ Component|@component_id }}")  
  .on("mouseover", function () {  
    d3.select(this).style("cursor", "pointer");  
    d3.select(this).style("opacity", 1);  
  })  
  .on("mouseout", function () {  
    d3.select(this).style("cursor", "default");  
    d3.select(this).style("opacity", 0.3);  
  })  
  .on("click", function () {  
    d3.select(this).style("opacity", 0);  
    saveSvgAsPng(  
      d3.select("#original_svg_{{ Component|@component_id }}")  
        .node(),  
      "{{ Component|@component_id }}" + '.png',  
      {backgroundColor: 'white', scale: 4}  
    );  
  });  
{% endif %}  
{%- endmacro %}
```

Code fragment wrapped within the "export()" macro
(associated to the "Export" functionality)

Template

```
function my(selection) {  
  selection.each(function () {  
    var tooltipScatterDiagram = d3.select("body").append("div")  
      .attr("class", "tooltip")  
      .attr("id", "compare-tooltip")  
      .style("display", "none")  
      .style("opacity", 0);  
  
    {{ chart_title.render_chart_title() }}  
    {{ control_bar.render_control_bar() }}  
    {{ render_structure.render_component_structure() }}  
    {{ control_panel.render_control_panel('query_handler', 'vis_id') }}  
    {{ export_functionality.export() }}  
    {{ overview_tooltip.create_overview_tooltip('vis_id') }}  
    {{ axis_functionality.render_axis_handlers('xText', 'yText', 'vis_id') }}  
  
    xScale = d3.scaleLinear()  
      .range([0, width]);  
  
    yScale = d3.scaleLinear()  
      .range([height, 0]);  
  
    rScale = d3.scaleLog()  
      .range([10, radius]);  
  });  
}
```

Component configuration



Macro

```
{% macro export() %}  
{% if Component.check('Exportation') == 'true' %} CONDITION  
d3.select("#save-{{ Component['@component_id'] }}")  
  .on("mouseover", function () {  
    d3.select(this).style("cursor", "pointer");  
    d3.select(this).style("opacity", 1);  
  })  
  .on("mouseout", function () {  
    d3.select(this).style("cursor", "default");  
    d3.select(this).style("opacity", 0.3);  
  })  
  .on("click", function () {  
    d3.select(this).style("opacity", 0);  
    saveSvgAsPng(d3.select("#original_svg_{{ Component['@component_id'] }}").node(),  
      "{{ Component['@component_id'] }} + '.png',  
      {  
        backgroundColor: 'white', scale: 4);  
  });  
{% endif %}  
{% endmacro %}
```

Generated source code

```
.style("float", "left")  
.style("position", "relative")  
.style("width", width + "px")  
.attr("id", "vis_container_ScatterDiagram_1");  
  
d3.select("#save-ScatterDiagram_1")  
  .on("mouseover", function() {  
    d3.select(this).style("cursor", "pointer");  
    d3.select(this).style("opacity", 1);  
  })  
  .on("mouseout", function() {  
    d3.select(this).style("cursor", "default");  
    d3.select(this).style("opacity", 0.3);  
  })  
  .on("click", function() {  
    d3.select(this).style("opacity", 0);  
    saveSvgAsPng(d3.select("#original_svg_ScatterDiagram_1").node(),  
      "ScatterDiagram_1 + '.png', {  
        backgroundColor: 'white',  
        scale: 4  
      });  
  });  
  
d3.select("body")  
  .append("div")  
  .attr("class", "tooltip")  
  .attr("id", "overview-tooltip-" + vis_id)
```

If the target condition is met, the associated functionality is injected in the final source code

A decorative network diagram in the top-left corner, consisting of interconnected nodes and lines, rendered in a light gray color.

5.

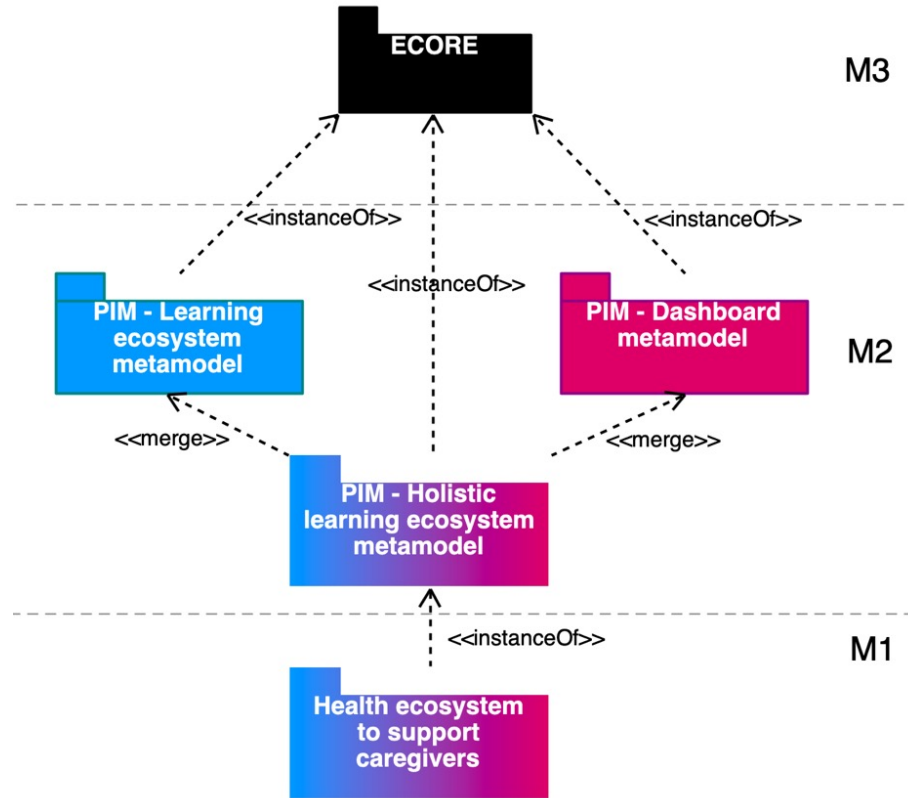
Applications

Meta-model integration

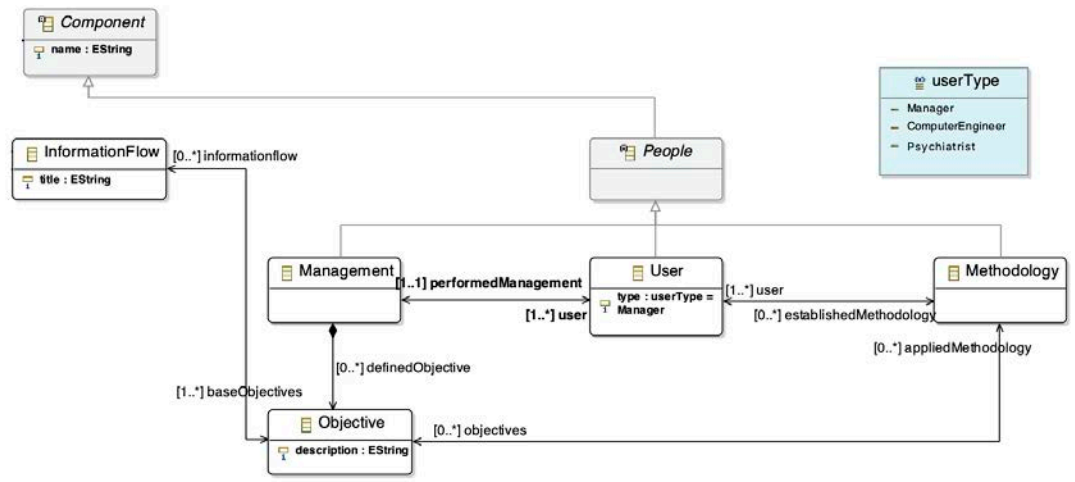
A background network diagram consisting of interconnected nodes and lines, rendered in a light gray color. The nodes are represented by small circles, some of which are larger and have a double-circle outline. The lines connecting them form a complex web of relationships.

HOLISTIC INTEGRATION

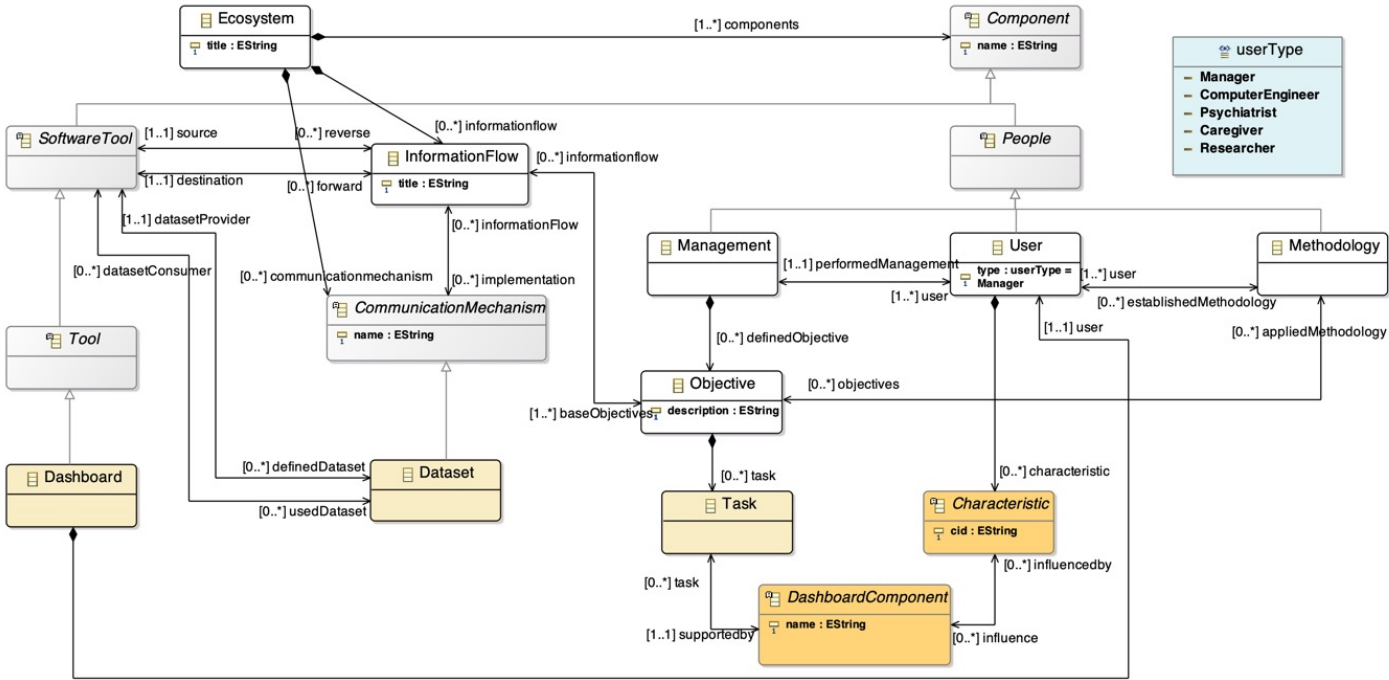
Integration



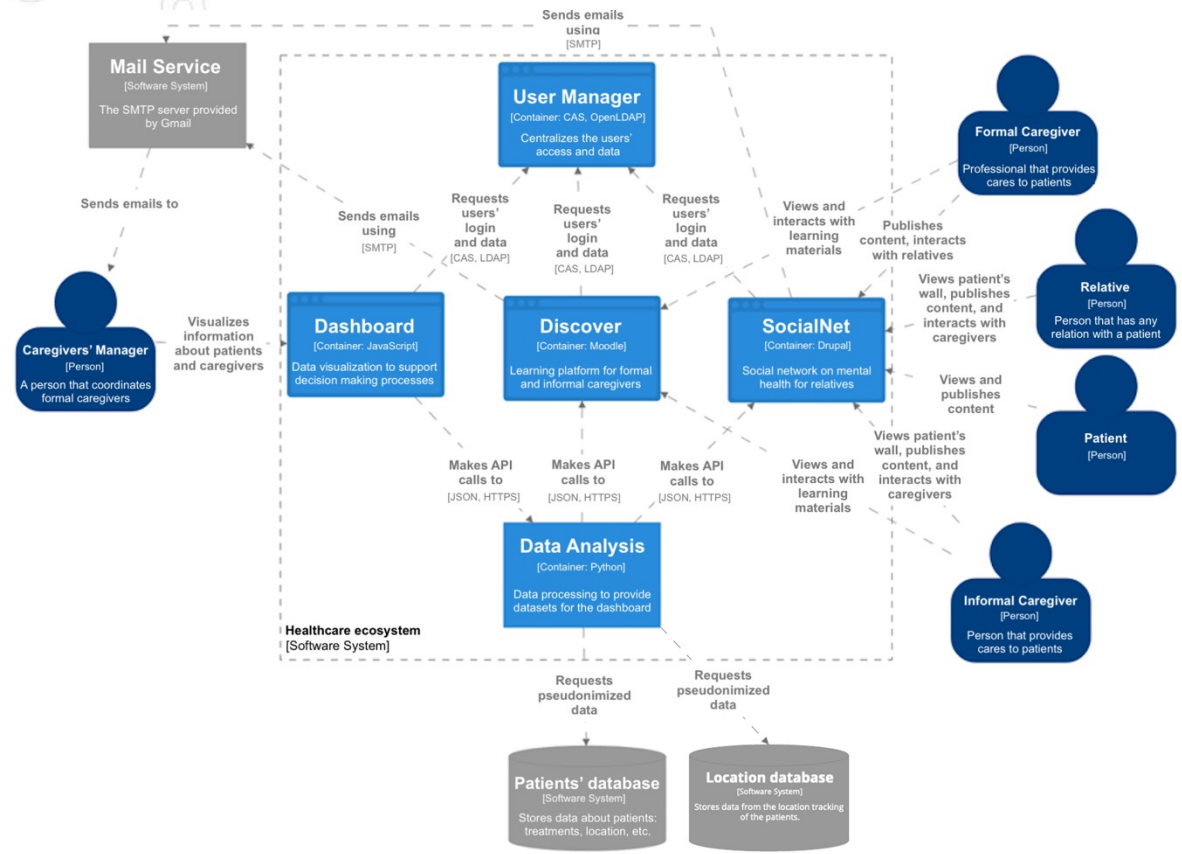
Human factor



Meta-model integration



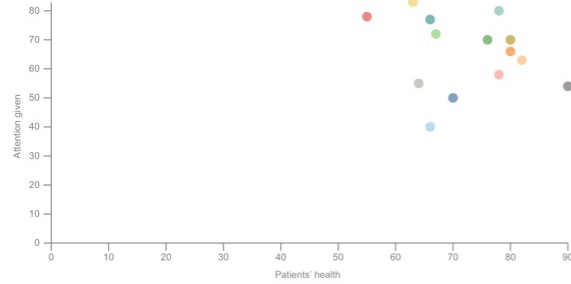
Architecture



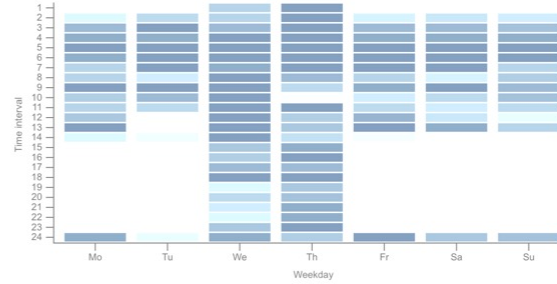
Dashboard generation

Test Dashboard

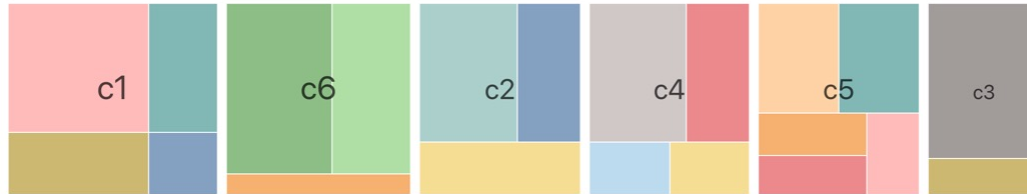
Patient's health v. attention given



Caregivers' workload over time



Caregivers' workload by patient

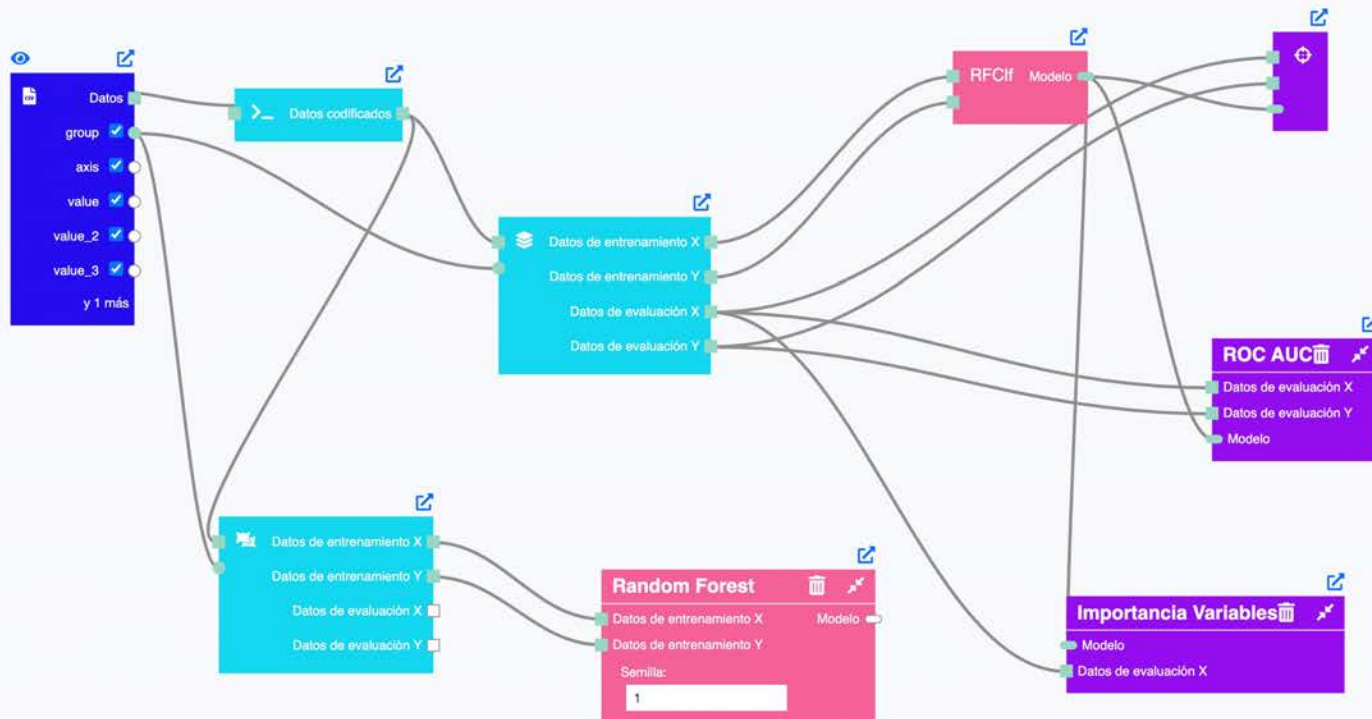




KOOPA-ML



- Datos
- Procesamiento
- Rellenar valores perdidos
- Codificar datos
- Separar conjuntos
- Validación Cruzada
- Algoritmos ML
- Evaluación ML
- Importancia Variables
- Clasificación
 - ROC AUC
 - Confusion Matrix
 - Accuracy
 - Precision
 - F1
 - Recall
 - Jaccard
 - Regresión
- Ejecutar
- Ver informe de evaluación
- Configurar proyecto
- Guardar proyecto



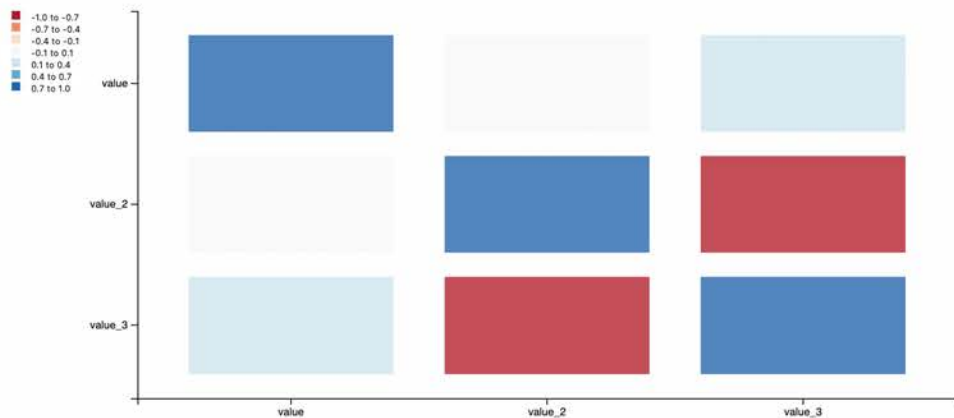
Sumario de los datos

Dataset

Resumen estadístico

Validación **1**

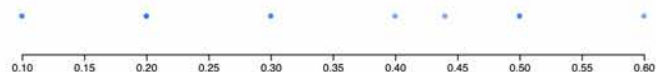
Correlation Matrix



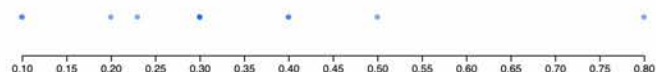
Variable Group2 distribution



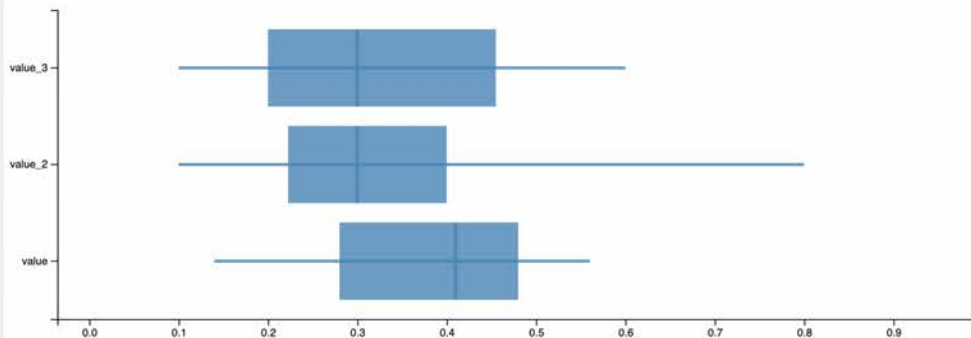
Variable value_3 distribution



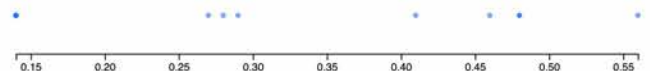
Variable value_2 distribution



Numeric variables distribution



Variable value distribution



Variable axis distribution

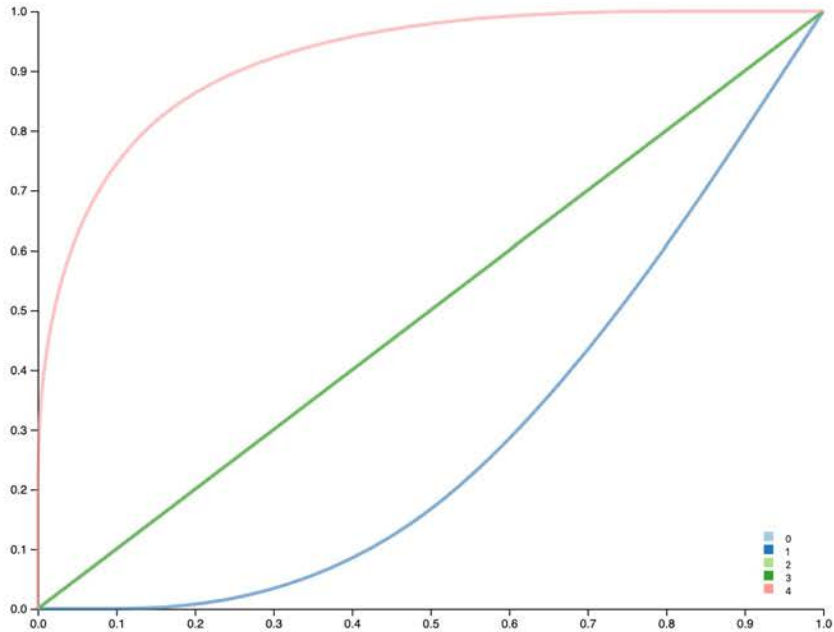


Variable group distribution

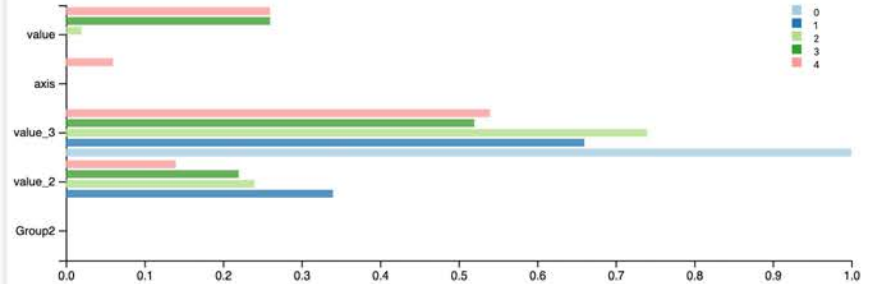


Sumario de métricas del modelo Random Forest (id: 16)

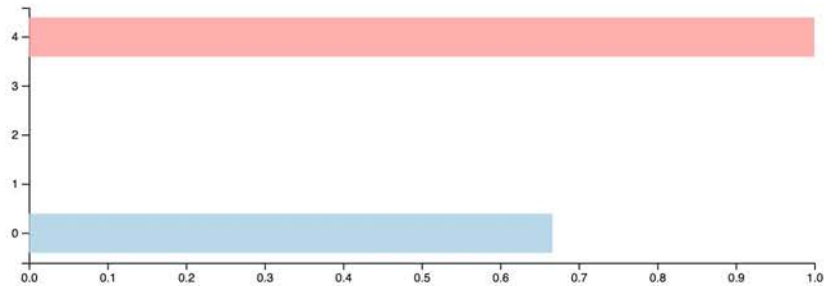
ROC curve



Features importance



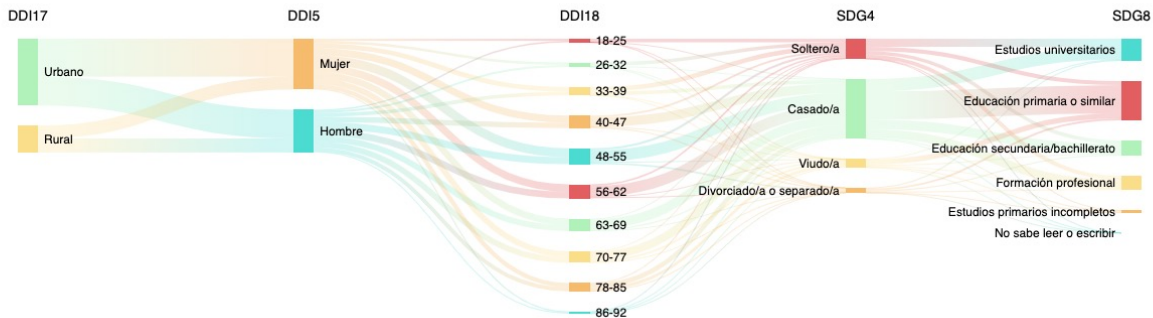
Cross value precision_binary score





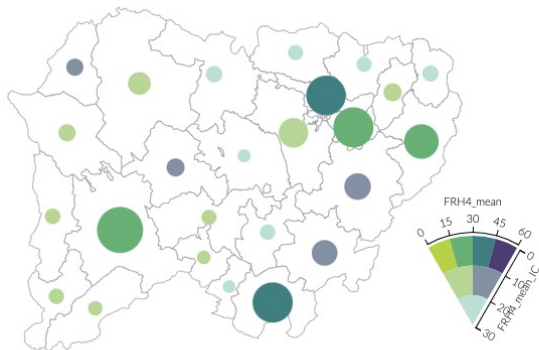
SALMANTICOR

- FRH4
Exfumador (desde hace más 1 año) 0 = No; 1 = Si
- FRH6
Vino 0=No; 1=Si
- FRH9
Cerveza 0=No; 1=Si
- FRH12
Chupitos 0=No; 1=Si
- FRH15
Copas 0=No; 1=Si
- FRH18
¿Tiene usted la TA alta? 0=No; 1=Si; 2=No sabe
- FRH19
¿Toma algún medicamento para la TA? 0=No; 1=Si; 2=No sabe
- FRH20
¿Tiene usted el colesterol alto? 0=No; 1=Si; 2=No sabe
- FRH21
¿Tiene usted el azúcar alto? 0=No; 1=Si; 2=No sabe
- FRH22
¿Ha padecido usted del corazón? 0=No; 1=Si; 2=No sabe
- FRH23
¿Algún familiar suyo ha tenido infarto o angina? 0=No; 1=Si; 2=No sabe



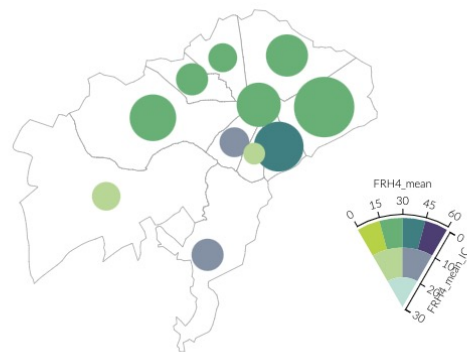
SALAMANCA - Rural

Media por cada 100 habitantes para la variable FRH6

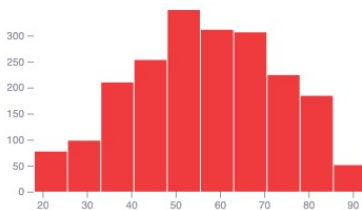


SALAMANCA - Urbano

Media por cada 100 habitantes para la variable FRH6



Edad



Buscar...

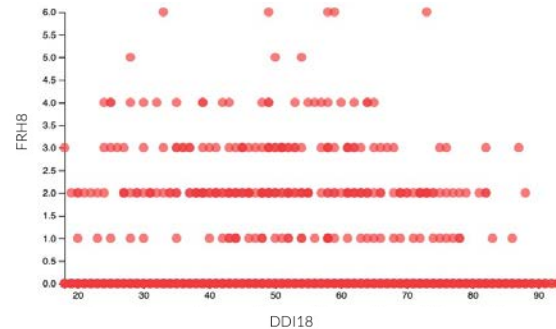
- + DDI5
Sexo 0=H; 1=M
- + DDI14
Código postal Hospital
- + DDI15
E Sing Hospital
- + DDI16
Municipio Hospital
- + DDI17
Ámbito 0=URBANO; 1=RURAL
- + **DDI18**
Edad

Correlación

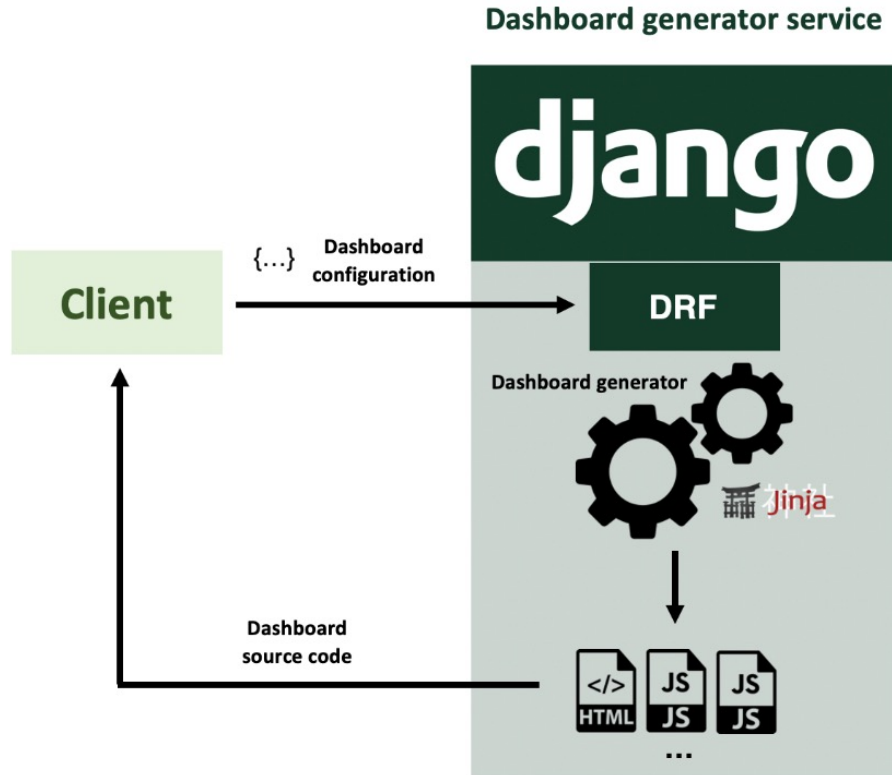
DDI18

FRHB

Vista previa HTML



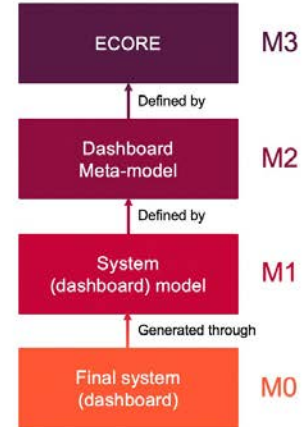
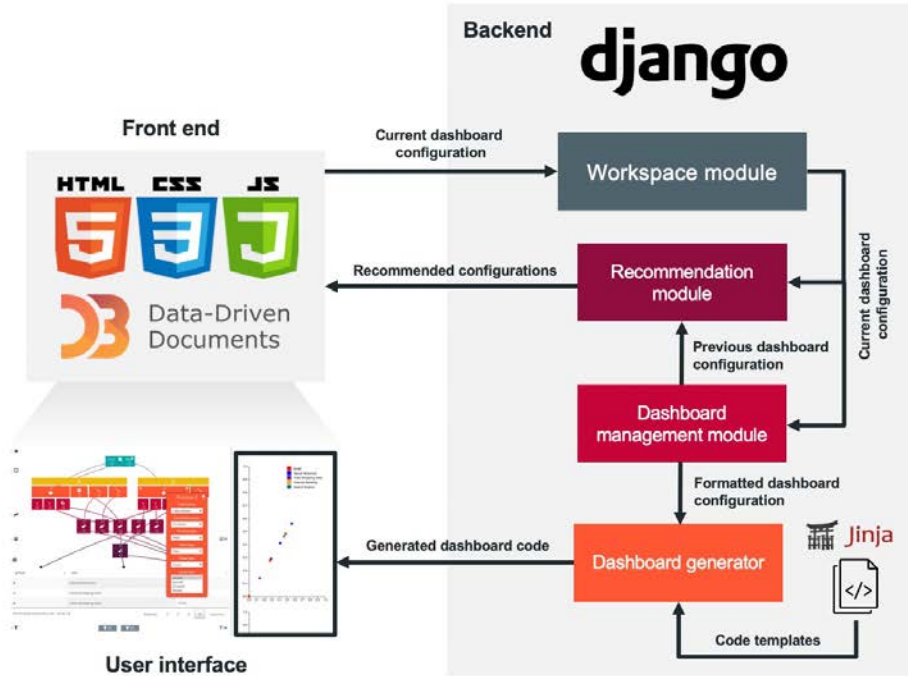
Architecture



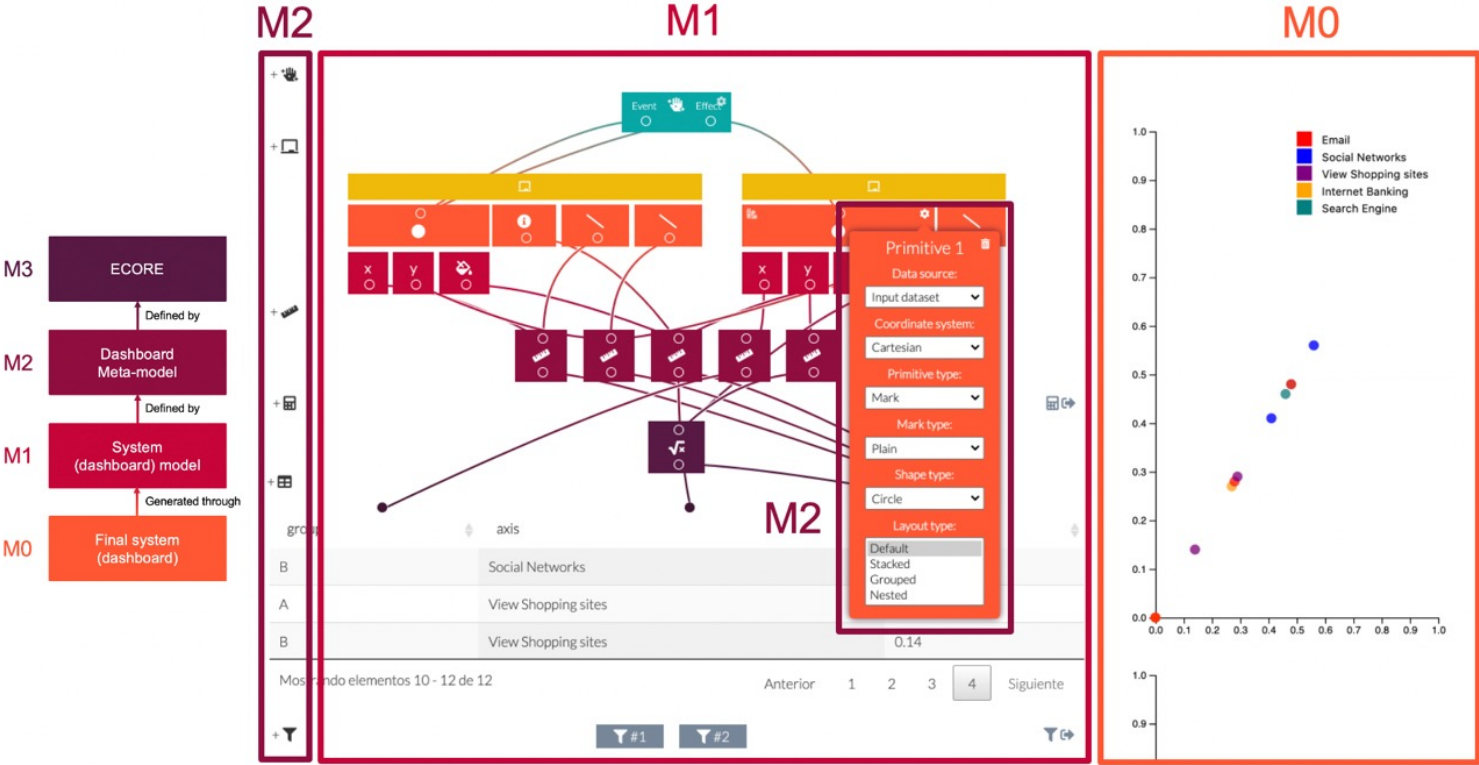


MetaViz

Architecture



Interface



Interface

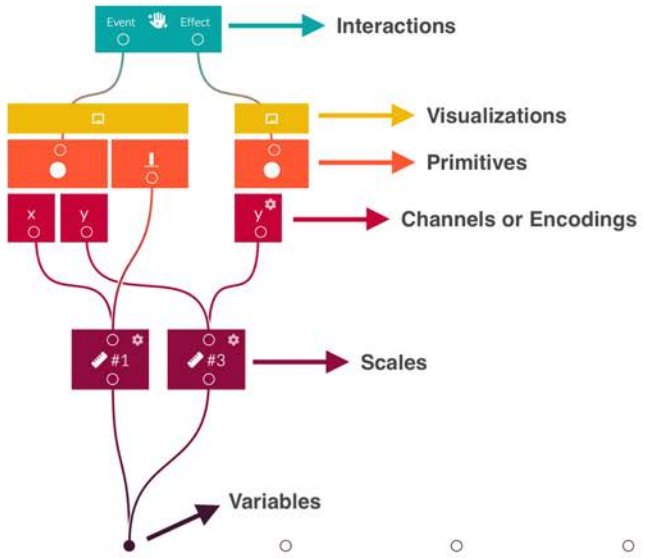
+ [Icon] → Add a new interaction

+ [Icon] → Add a new visualization

+ [Icon] → Add a new scale

+ [Icon] → Add a new dataset

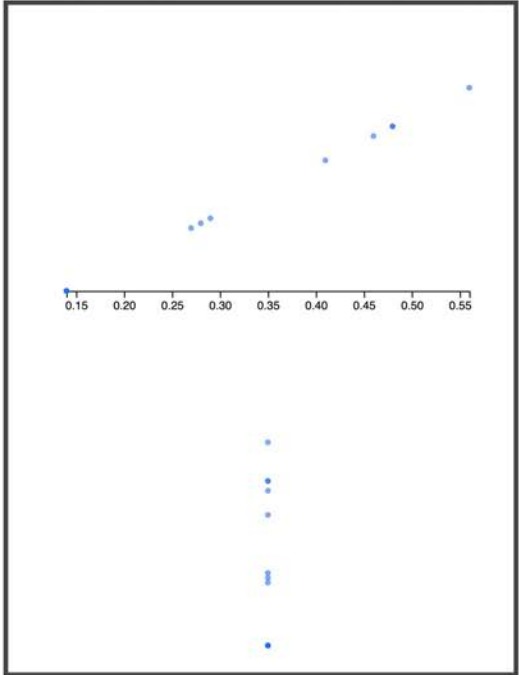
+ [Icon] → Add a new filter



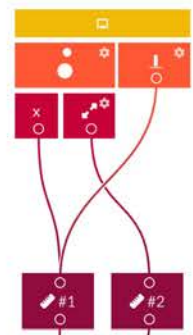
group	axis	value	value_2	value_3	Group2
A	Email	0.48	0.3	0.44	X
A	Social Networks	0.41	0.1	0.5	Z
A	Internet Banking	0.27	0.2	0.6	X

Showing 1 to 3 of 12 entries

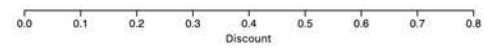
First Previous **1** 2 3 4 Next Last



Generated visualizations



Test 1



Ship Mode	Sales	Quantity	Segment	Discount	Country	City	State	Postal Code	Region	Category	Sub-Category
First Class	1097.5439999999999	7	Corporate	0.2	United States	Richardson	Texas	75080	Central	Technology	Phones
First Class	190.92	5	Corporate	0.6	United States	Richardson	Texas	75080	Central	Furniture	Furnishings
First Class	45.98	2	Corporate	0.0	United States	Eagan	Minnesota	55122	Central	Technology	Accessories

Showing 1 to 3 of 298 entries



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Thank you!

Questions?

Meta-modeling technological ecosystems in different application domains



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