

# Visualizing Connectivity within Innovation Ecosystems in Europe



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**Innovation ecosystems refer to the economic dynamics of the complex relationships that are formed between the material resources and human capital with a functional goal to enable technology development and innovation.**

**The EuroTech Universities Alliance is a vivid example of European cooperation in science and technology, so its innovation ecosystem was set as the study case to propose a methodology and a prototypical implementation.**

**This thesis proposes a prototype enabled to analyze and retrieve information about relations among European universities, companies, start-ups, and research institutions (Fig. 1).**

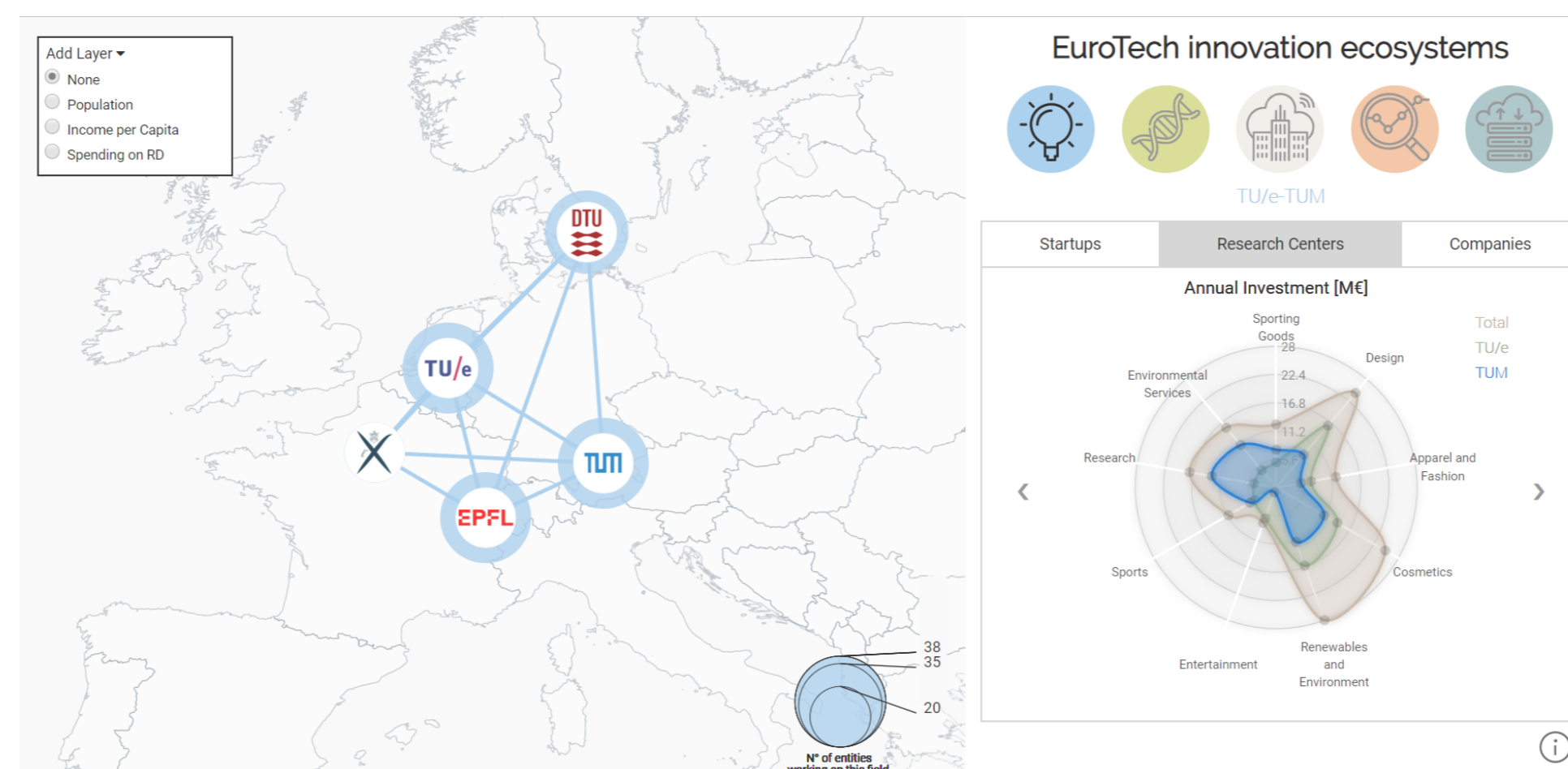


Figure 1. Visualizing connectivity among EuroTech Universities Alliance

e.g., multi-source, various formats, with diverse levels of quality and resolution.

## VISUALIZATION METHODS

On one hand, the spatial data is presented on a map representation using a geographic network visualization approach. The map is not only used to provide spatial context, but also to add meaningful information, such as economic indexes for each country or activity level for each university belonging to the network.

On the other hand, the non-spatial data is presented in the form of statistical charts. Both visualization methods provide complementary information to efficiently convey the available space and avoid showing overlapping data.

## PROTOTYPE

HTML, CSS, JS, and D3 were combined to build a prototype of an interactive web map. Based on the data model and the

visualization methods, the prototype presents three interconnected elements:

- Data filtering according to the user's field of interest.
- Visual data exploration within a map view.
- Data analytics via statistics view.

Users can explore the connectivity between universities through the network visualization, where each edge can be visualized and analyzed in the statistics view (Fig. 1). Figure 3 presents the prototype's interactive workflow.

## CONCLUSION

A solid data model, a suitable visualization method, and an interactive prototype combining statistical graphics and thematic web cartography introduce a new approach for the visualization of innovation ecosystems from a cartographic perspective. The approach needs to be validated by conducting a proper user study.

## OBJECTIVES

- To identify the elements that can best describe the complexities among innovation ecosystems.
- To compare network visualization techniques and determine a suitable method that can emphasize the connectivity between those elements.
- To build a prototype of an interactive thematic web map enabled to visually represent scientific and technological networks.

## DATA MODEL

The data model design used to develop the prototype is composed of spatial and non-spatial data concerning the main components of universities' innovation ecosystems (see Fig 2).

The proposed model successfully integrates and connects heterogeneous data,

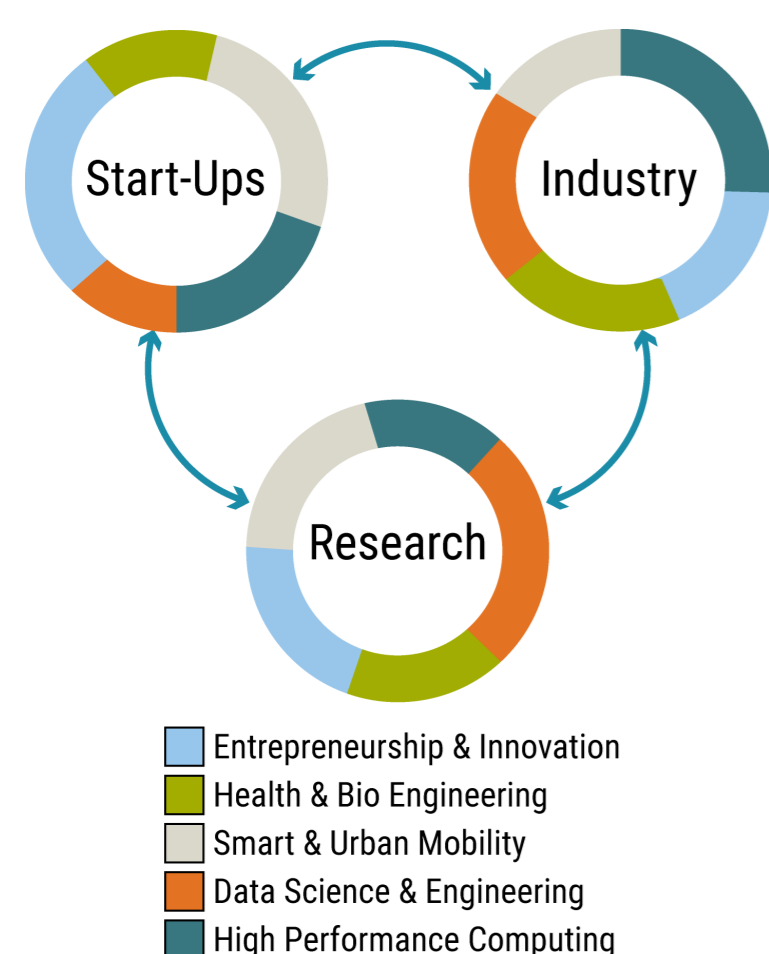


Figure 2. Main components of universities' innovation ecosystems

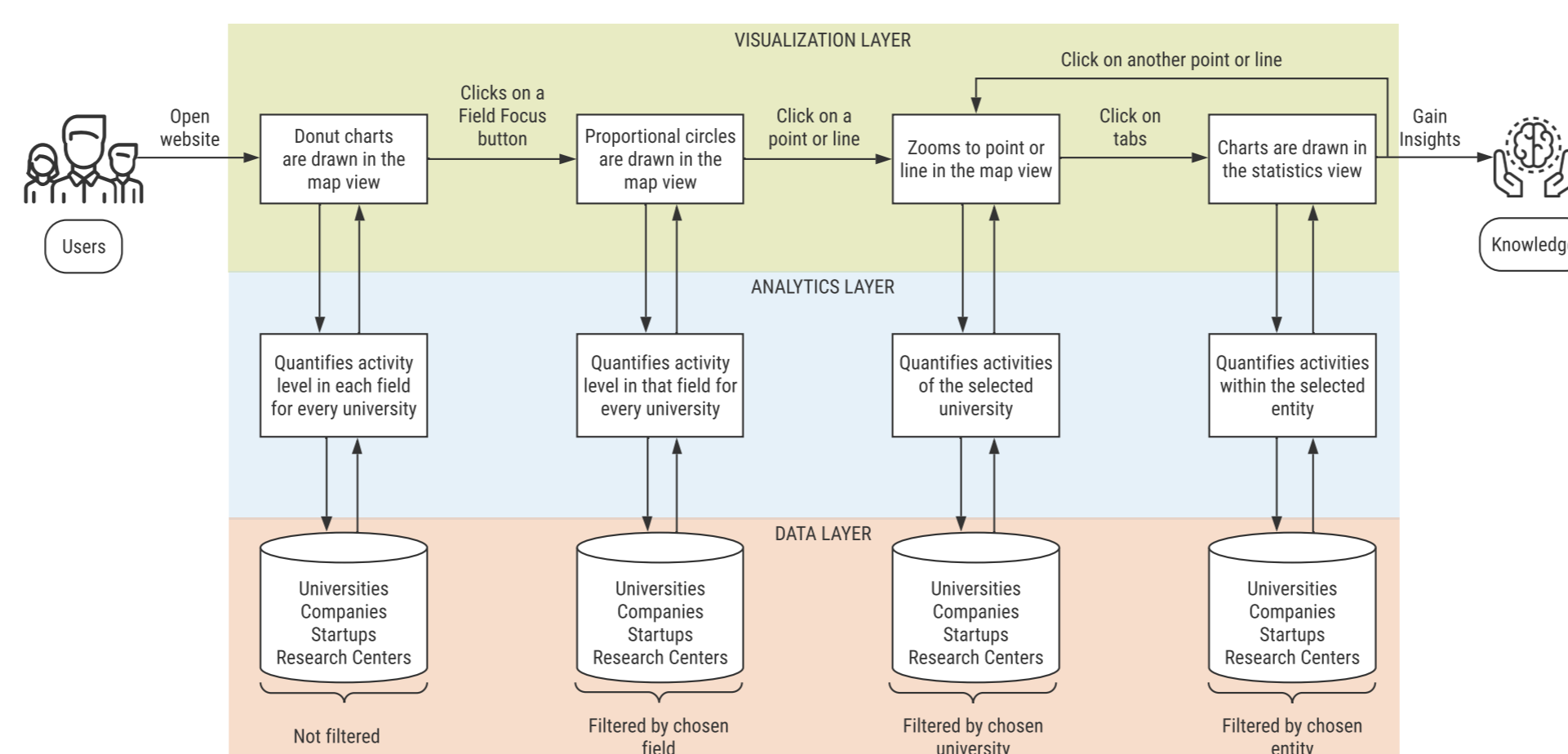


Figure 3. Prototype's interactive application workflow – Icons from www.flaticon.com

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## KEYWORDS

innovation ecosystems, data visualization, network visualization, interactive web cartography

## PROJECT LINK

<https://zarinaacero.github.io/EuroTechProject/>