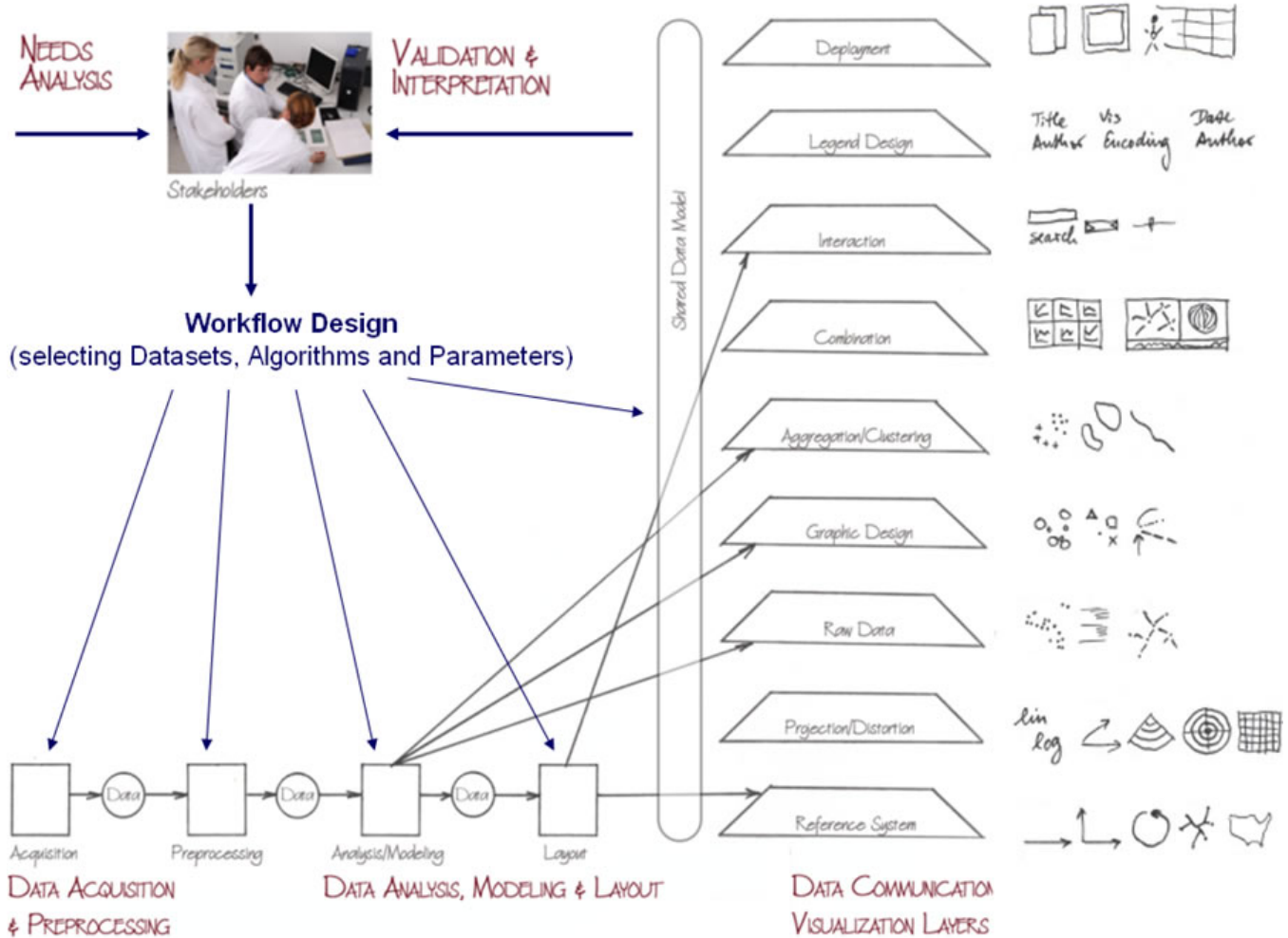


# 4.1 Overview

A typical science study starts with a **Needs Analysis** of a selected stakeholder group that informs the subsequent workflow design, involving **Data Acquisition and Processing**; **Data Analysis, Modeling, and Layout**; and **Data Communication–Visualization Layers**. All datasets, algorithms, and parameter values used in a study have to be documented in detail in support of replication and interpretation. The resulting **Validation and Interpretation** should then proceed in collaboration with domain experts and stakeholders. Insights gained might generate additional insight needs or inspire changes to the workflow. The process is highly incremental, often demanding many cycles of revision and refinement to ensure the best datasets are used, optimal algorithm parameters applied, and clearest insight achieved.



**Figure 4.1: Needs-driven workflow design using a modular data acquisition/analysis/modeling/visualization pipeline as well as visualization layers**

Note that the visualization layers interact with other workflow elements such as analysis algorithms (e.g., network analysis algorithms that compute additional node/edge attributes for graphic design, clustering techniques that identify cluster boundaries), or layout algorithms (e.g., network layouts that compute a spatial reference system).