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From Decisions to Designs: A Hands-On Tutorial with the Typology of Decision-Making Tasks

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Abstract

Designing visualizations for decision-making often requires structuring complex, multi-stage workflows that remain implicit during the design process. This hands-on tutorial introduces the Typology of Decision-Making Tasks for Visualization, a concise framework for modeling decision workflows using three composable tasks: choose, activate, and create. Participants will learn how to represent decision problems as structured node-link diagrams that make task hierarchy, information flow, and iteration explicit. Through guided small-group exercises, attendees will model a real-world decision-support scenario and then translate their task diagrams into visualization design sketches. The tutorial emphasizes the transition from structured problem definition to interface design, demonstrating how different decision tasks naturally inform interaction components, layout structure, and system logic. Designed for visualization researchers, designers, and practitioners at all experience levels, the tutorial combines conceptual foundations with collaborative exercises and discussion. Participants will leave with a practical methodology for externalizing decision problems and using them as blueprints for designing interactive decision-support visualizations.
(see https://www.acm.org/publications/class-2012)

CCS Concepts

• ***Human-centered computing*** → ***Visualization theory, concepts and paradigms;***

1. Intended audience

This tutorial is well-suited for visualization researchers, designers, and practitioners at all experience levels working on tools that support user-driven analysis and decision-making. People at all career stages are welcome. Familiarity with the visualization design process is assumed, but no prior knowledge of task typologies is required.

2. Description of the topic

This section outlines the motivation for the tutorial, its relevance to the EuroVis community, and the key concepts and skills that will be covered.

2.1. Motivation

Visualization research has traditionally focused on supporting data exploration, analysis, and pattern discovery. However, in many real-world contexts such as healthcare, engineering, policy, and business intelligence, the ultimate goal of visualization is not merely analysis, but informed decision-making. Despite this, the field lacks concise, domain-agnostic methods for explicitly modeling decision problems during visualization design. Existing task typologies and design frameworks primarily emphasize analytic operations or interaction techniques [BM13, AES05], offering limited scaffolding for articulating complex, multi-stage decision workflows that involve constraints, trade-offs, iteration, and the generation of alternatives.

As a result, designers often move directly from loosely defined user goals to interface sketches, leaving decision structures implicit. This makes it difficult to reason about decision task dependencies, align interface components with decision-making steps, or communicate decision logic across interdisciplinary teams. This tutorial addresses this methodological gap by introducing a structured framework for modeling decision-making problems, positioning decision modeling as a foundational layer that bridges problem formulation and interface design within visualization research and practice.

2.2. Relevance to the EuroVis Conference

This tutorial aligns strongly with EuroVis's focus on cross-cutting topics in visualization research and practice. It contributes to visualization design and evaluation methods by introducing a structured approach for modeling decision workflows prior to prototyping, helping bridge the often implicit gap between problem formulation and interface design. The tutorial connects multiple areas within the community (including visual analytics, decision-support systems, human-centered design, and interactive system architecture)

by providing a shared language for reasoning about complex decision problems. Because the typology is domain-agnostic, it supports applications across diverse areas such as clinical decision-making, engineering design, and policy analysis, making it relevant to both researchers and practitioners. Moreover, by focusing explicitly on decision modeling rather than traditional analytic task taxonomies, the tutorial introduces an emerging methodological perspective that extends beyond the standard visualization curriculum. Grounded in recent empirical research and validated through controlled studies, the tutorial integrates theoretical foundations with hands-on design practice, offering attendees both conceptual insight and immediately applicable skills.

2.3. Aspects to be Covered

This tutorial introduces the Typology of Decision-Making Tasks for Visualization [BMA*25], a domain-agnostic framework for modeling decision problems in visualization design. The typology consists of three core decision tasks: *choose* (selecting an optimal option or subset among alternatives), *activate* (constraining or filtering options based on thresholds or criteria), and *create* (generating, synthesizing, or deriving new alternatives). These tasks can be composed, sequenced, and arranged hierarchically to represent complex, multi-stage decision workflows. Using a node-link diagrammatic representation, the typology makes information flow, dependencies, and iteration explicit, enabling designers to externalize reasoning processes and use structured decision models as blueprints for visualization design.

Participants will gain both a conceptual understanding and practical skills for applying this framework. First, they will learn how the three decision tasks were derived through extensive literature review and expert validation, and how the typology provides a shared language for modeling how users reason through complex decisions. Second, through guided exercises, they will practice decomposing real-world decision problems into structured task diagrams, identifying sub-tasks, representing information flow, and surfacing implicit assumptions. Third, the tutorial will demonstrate how these structured decision models can directly inform visualization design: *activate* tasks often suggest filtering and control interfaces, *create* tasks inform generative or analytical components, and *choose* tasks map to comparison views or final selection mechanisms. Participants will also explore how composability and hierarchy support modular and iterative interface design, aligning visualization components with cognitive and procedural stages of decision-making. Finally, the tutorial will conclude with a discussion of open research directions, including extensions of the typology for collaborative or role-based decision-making, contextual annotations, and design evaluation. Overall, attendees will leave equipped with a principled yet practical methodology for structuring, designing, and communicating decision-support visualizations.

3. Description of the organization

This tutorial is organized into two main sessions of 90 minutes each, separated by a 30-minute break. The structure is designed to progressively build participants' understanding and practical ability to use the Typology of Decision-Making Tasks for Visualization for both modeling decision problems and designing visualization solutions.

3.1. Session 1: Modeling Decisions with the Typology (90 minutes)

3.1.1. Introduction to the Typology (20 minutes)

We will briefly situate the typology as a structured approach for modeling complex decision workflows, review its visual language (nodes, links, hierarchy, and composability), and illustrate its application through real-world case study diagrams.

3.1.2. Q&A (15 minutes)

Participants will be invited to ask questions about the definitions, task boundaries, composability, diagramming, and use cases.

3.1.3. Group Setup and Problem Briefing (10 minutes)

Participants will pair up or form groups three depending on the number of participants. Each group will receive the same open-ended decision-support scenario (e.g., designing a decision-support tool for multi-agency satellite development). We will emphasize that the goal is not to design a solution yet, but to model the decision structure itself.

3.1.4. Exercise: Decision Modeling with the Typology (30 minutes)

Groups will use the typology to decompose the problem into tasks, externalize reasoning pathways, and represent task interdependencies in structured diagrams. The exercise encourages identifying hierarchies, task sequences, and feedback loops. We will emphasize that diagramming not only clarifies complex decisions but also acts as a blueprint for subsequent design stages.

3.1.5. Sharing and Reflection (15 minutes)

After completing the group modeling exercise, volunteers will be invited to briefly present their decision diagrams. Each group will describe:

- Their high-level structure: What is the top-level decision? What sub-decisions support it?
- How they composed *choose*, *activate*, and *create* tasks to capture the decision workflow.
- Challenges encountered while modeling (e.g., ambiguity between tasks, uncertainty in structuring loops).

Depending on the amount of time left, we will then facilitate a guided discussion focusing on the following key reflection points:

- Expressiveness: How easily were participants able to represent their decision-making problem using only *choose*, *activate*, and *create*? Did the typology help clarify the information flow and dependencies in the decision?
- Composability and Hierarchy: How did participants decompose high-level decisions into subtasks? Did their diagrams naturally show hierarchical levels of reasoning (e.g., Level 1 overarching goal, Level 2 supporting decisions)?

- Correctness and Fit: Were there any parts of the problem that felt difficult to capture with the three decision tasks? Were there cases where participants debated whether an action was best represented as *activate* versus *choose*, for example?
- Externalization and Reflection: Did diagramming the decision problem help participants surface implicit assumptions, iterative loops, or missing steps they hadn't initially considered?
- Flexibility and Multiple Reasoning Styles: How did participants' approaches vary (e.g., top-down vs bottom-up)?
- Connection to the participants' work: In participants' own projects, where might modeling the decision-making structure with this typology help define problems more clearly, clarify goals, or structure user interactions? What aspects of a decision-making problem could become easier to externalize or communicate by starting with a decision diagram?

3.2. Session 2: Designing with the Typology (90 minutes)

3.2.1. Design Implications of the Typology (15 minutes)

This segment will focus on how structured decision models, created using the Typology of Decision-Making Tasks, can directly inform visualization design.

We will discuss several key design insights:

- Mapping Tasks to Views and Interactions: Participants will see how different decision tasks naturally suggest different types of interface components. *activate* tasks often lead to the design of filter panels or control widgets that narrow option spaces. *create* tasks suggest components that allow for generating or combining alternatives, such as synthesis views or simulation panels. *choose* tasks imply the need for overview, summary or comparison interfaces that support final selection among viable options.
- Structuring Interaction Flow: Task diagrams can serve as blueprints for the logical flow of user interaction. Sequential flows between tasks can guide users through progressive decision stages, while loops in the diagram suggest opportunities for iterative refinement or revisiting earlier decisions.
- Supporting Hierarchical and Modular Design: Participants will explore how hierarchical structures in their task diagrams can help define modular views or steps in the interface. Sub-decisions at lower levels can correspond to detailed visualizations or drill-down panels, while higher-level decision tasks may summarize aggregated outcomes.
- Making Iteration Explicit: Iterative or cyclical pathways identified during the decision modeling phase can be directly incorporated into the design, informing how the system supports revisiting earlier choices or dynamically updating recommendations.
- Scaffolding Design Reasoning and Communication: Beyond structuring the visualization itself, the decision models created with the typology can serve as communication tools, helping design teams reason about user goals, task dependencies, and interaction priorities throughout the design process.

3.2.2. Q&A (10 minutes)

Participants will have the opportunity to ask any questions related to the use of the typology in the design exercise.

3.2.3. Exercise: Interface Design Based on Typology Diagrams (45 minutes)

Each group will now use the diagram they developed earlier to sketch a visualization prototype that supports the modeled decision-making process. Focus areas include:

- How to align the visual layout with task structure
- Mapping task transitions to user interactions
- Ensuring that iterative and hierarchical decision pathways are supported

3.2.4. Sharing and Discussion (20 minutes)

Groups will present sketches or mockups. Discussion topics will include:

- Strengths and challenges in moving from structured problem definition to design
- Flexibility versus structure: when to adhere to or adapt the task diagram
- How the typology could extend to collaborative decision-making, role-based workflows, or tooling for rapid prototyping

We will conclude with key takeaways and invite participants to reflect on future research opportunities, such as developing lower-level design languages for decision-making tasks or combining the typology with broader visualization design frameworks.

4. Instructor Information

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Camelia D. Brumar is a Ph.D. candidate in Computer Science at Tufts University, advised by Professor Remco Chang. Her research focuses on visualization design methods and decision-support systems. She introduced the Typology of Decision-Making Tasks for Visualization, a composable framework for modeling and designing decision-support visualizations, which has been validated through controlled studies and applied in both academic and industry contexts. Prior to and during her doctoral work, she developed visual decision-support tools in collaboration with industry and clinical partners.

5. Equipment Needed

Participants will need to bring a pen and multiple sheets of paper for diagramming and sketching exercises. Tables are necessary to support small-group collaboration and hands-on activities. A projector will be used to display the instructions during the session. We encourage participants to bring a laptop or tablet so they can easily access the reference materials during the exercises. No other materials are needed.

References

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