A SUSTAINABILITY REQUIREMENTS CATALOG FOR THE SOCIAL AND TECHNICAL DIMENSIONS

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AGENDA

01 | Context & Motivation

02 | Sustainability requirements in RE (SMS)

03 | Sustainability Catalog Conceptualization

04 | Sustainability Catalog Implementation

05 | Evaluation

06 | Conclusions and future work

01

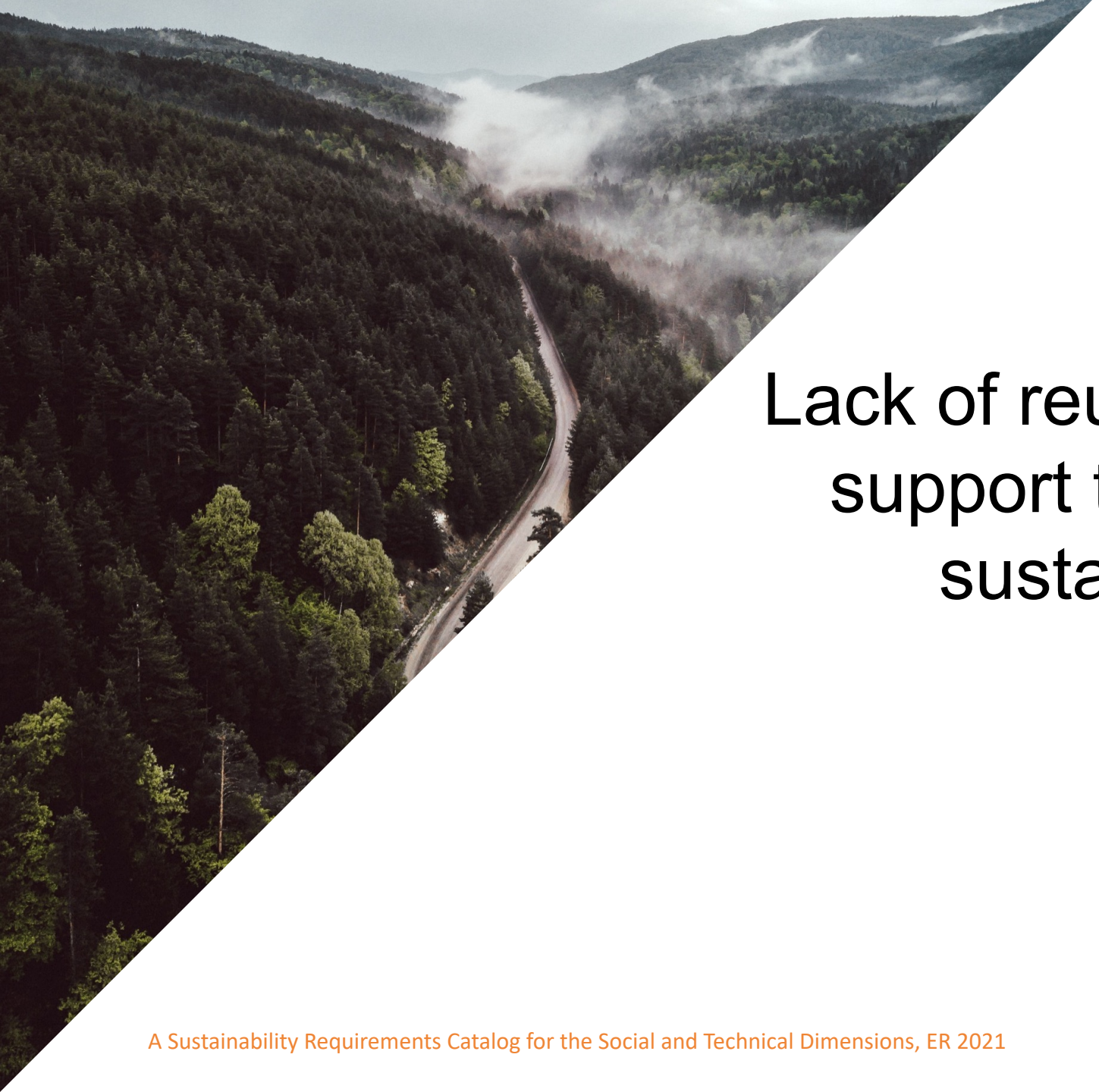
CONTEXT & MOTIVATION

CONTEXT & MOTIVATION | Sustainability notions in requirements engineering increase support for sustainable software

- *[sustainable development] "meets the needs of the present without compromising the ability of future generations to meet their own needs" **
- Sustainability is "an emergent property of a software system" ***
- A complex composite quality attribute, formed of five complex aggregates of quality attributes

* Brundtland, G.H.: Our common future: development that meets the needs of the present without compromising the ability of future generations to meet their own needs ". World Commission on Environment and Development [WCED] (1987)

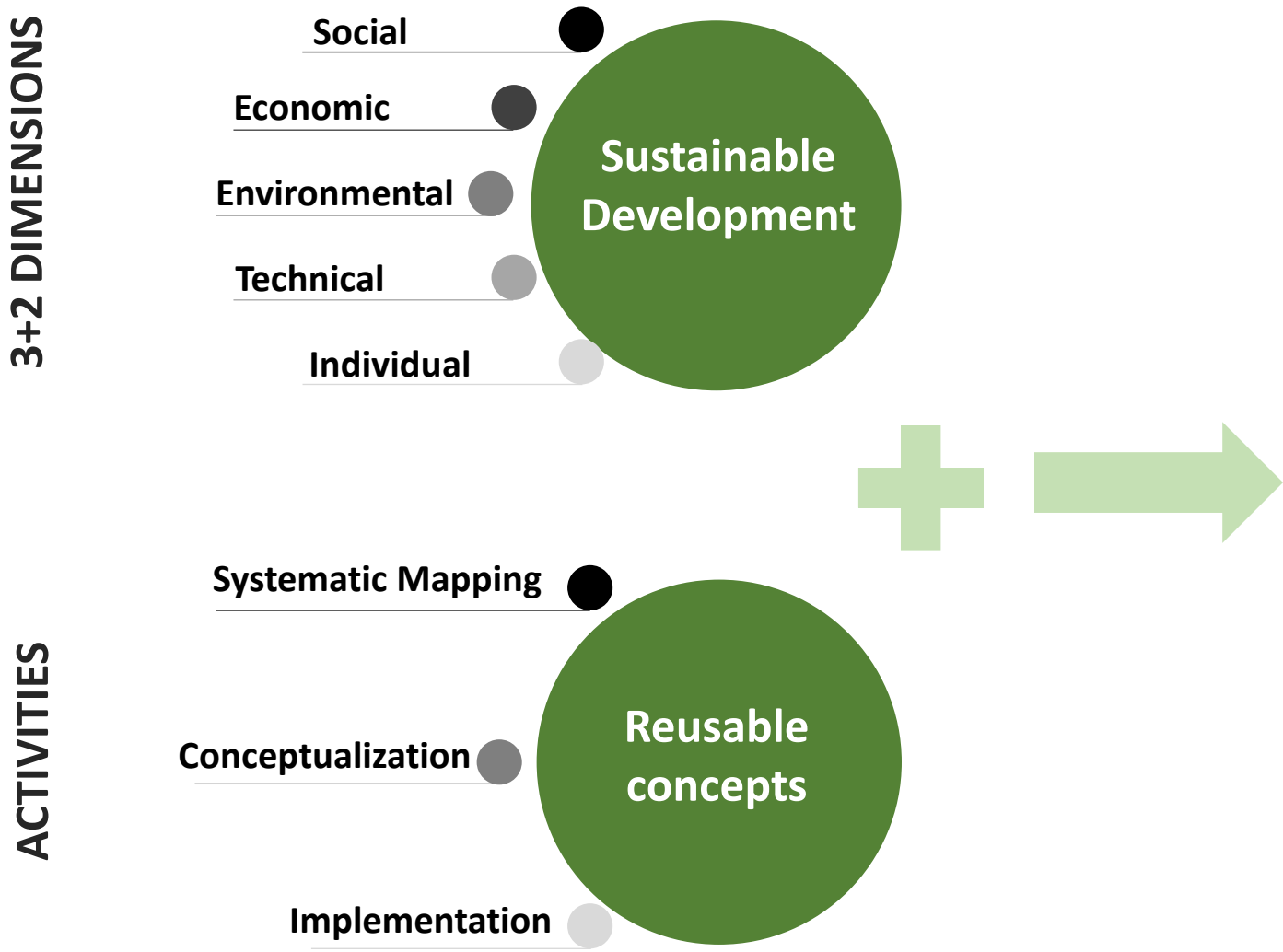
** Venters,C.C.,etal.:Softwaresustainability:Themoderntowerofbabel.In:CEUR WS Proceedings. vol. 1216, pp. 7–12. CEUR (2014)



PROBLEM

Lack of reusable approaches to support the development of sustainable software

Goal| Sustainability notions in requirements engineering increase support for sustainable software



Sustainability catalog

02

SUSTAINABILITY REQUIREMENTS IN RE
(SYSTEMATIC MAPPING REVIEW)

STATE OF THE ART | Increased completeness of state of the art with a systematic mapping study

PLANNING

- Research Questions
- Search Strategy
- Inclusion & Exclusion Criteria

What are the requirements that contribute or relate to sustainability?

CONDUCTION

- Automated Search
- Keyword Manual Search
- Snowballing

From 169 studies a total of 12 papers were selected

REPORTING

- Results Analysis

No reusable catalogues
Relevant concepts
Relevant relationships

03

SUSTAINABILITY CATALOG CONCEPTUALIZATION

CONCEPTUALIZATION| data collected and focus

- Relevant data for four of the five dimensions: social, environmental, economic, technical
- Focus: Social and Technical dimensions

CONCEPTUALIZATION| Each dimension has a set of requirements that relate to them

SOCIAL

Satisfaction
- Usefulness
  Trust
  Fairness

Security
- Confidentiality
  Authenticity
  Integrity
  Accountability

Social Safety
- Freedom from risk
  Legislation

TECHNICAL

Functionality
- Functional Appropriateness
- Functional Correctness

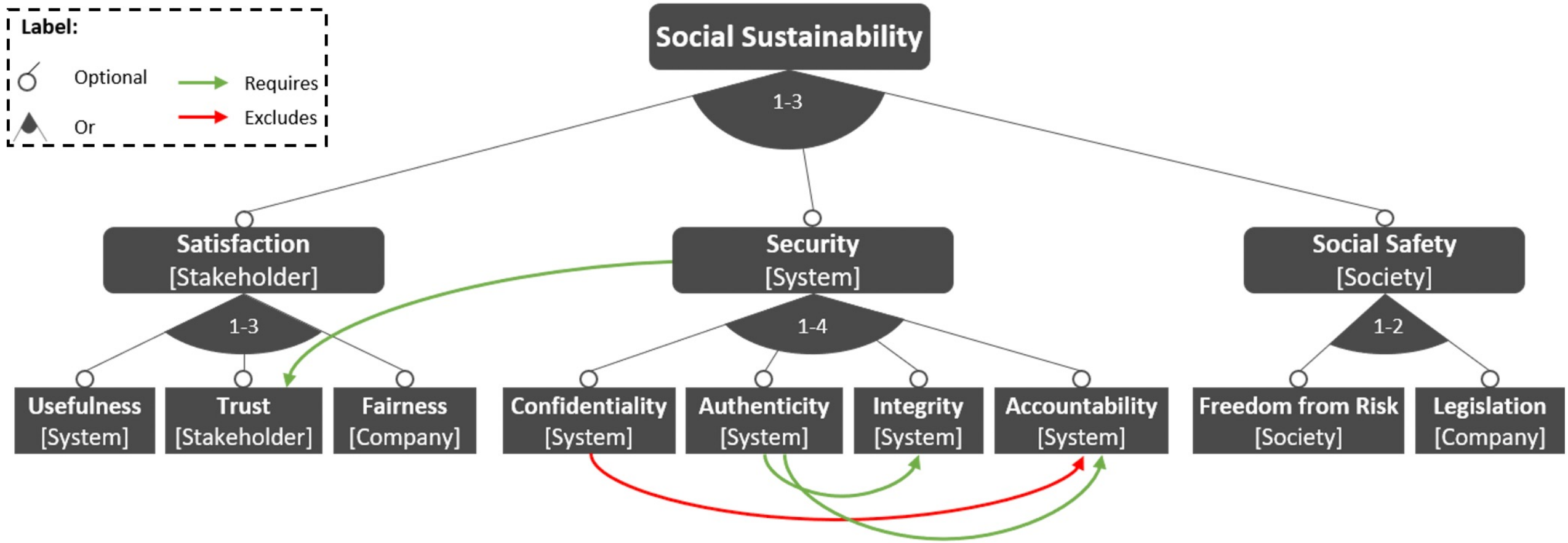
Maintainability
- Testability
- Modularity
- Modifiability

Compatibility
- Adaptability
- Interoperability

Reliability
- Availability
- Recoverability
- Fault tolerance

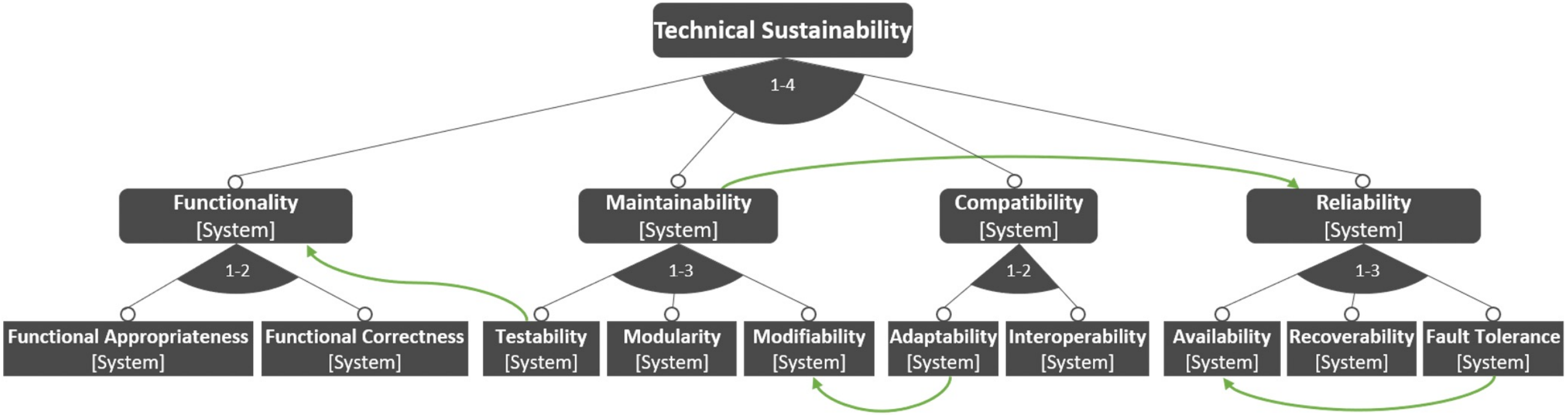
CONCEPTUALIZATION| Feature model defines high-level view of a dimension and its intra relationships

Social Feature Model



CONCEPTUALIZATION| Feature model defines high-level view of a dimension and its intra relationships

Technical Feature Model



CONCEPTUALIZATION| Effects among dimensions, be them beneficial or prejudicial

- Sustainability dimensions have diferent types of effects on each other
- If a product has diverse functionalities and is reliable and provides interoperability, it may impact positively on the user satisfaction (social sustainability)
- Society can also have a positive impact on the technical side of a product by providing feedback and suggest new functionalities

04

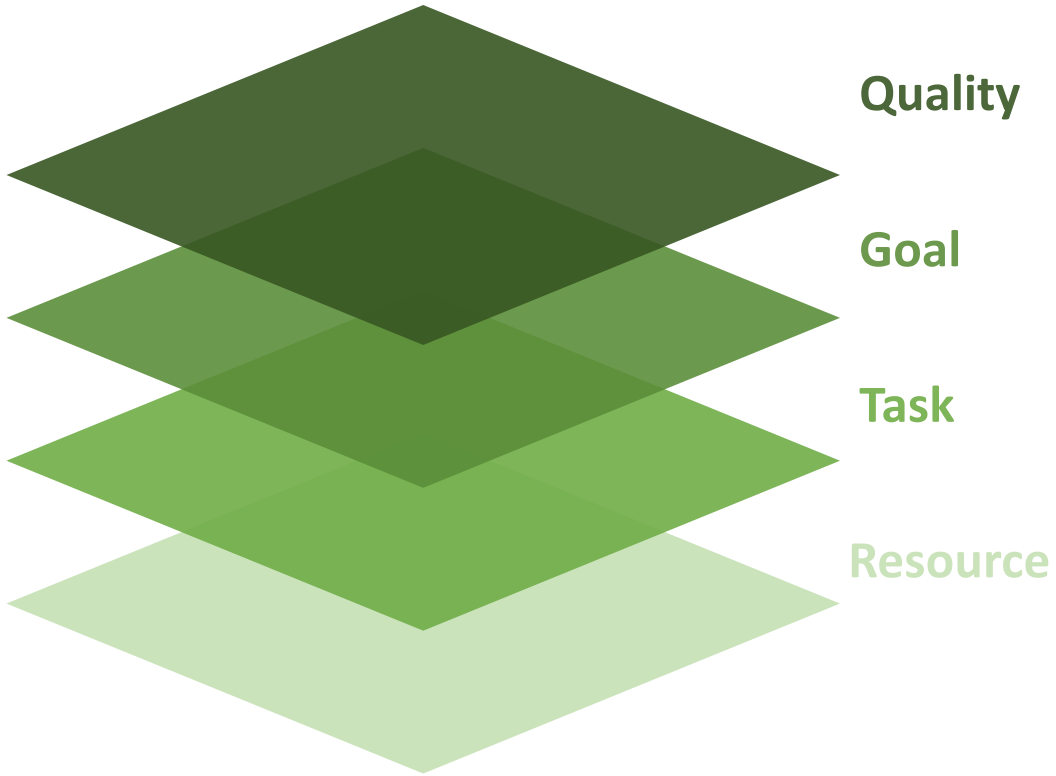
SUSTAINABILITY CATALOG IMPLEMENTATION

IMPLEMENTATION| Feature model elements mapped into iStar elements, and qualities refined

Mapping (Feature → iStar)

Source (Feature)	Target (iStar)
Main Feature	Quality
Sub-feature	Quality
Optional Link	Help or Make
Requires	Help or Make
Excludes	Hurt or Break

Refinement (iStar)

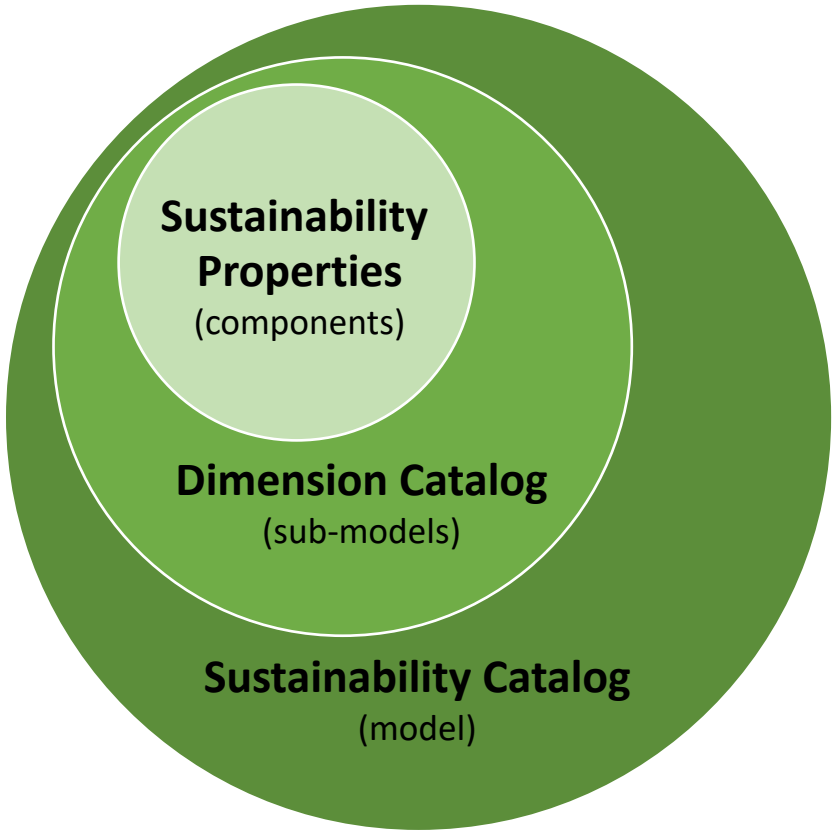


IMPLEMENTATION| Open-source goal modelling piStar tool, bottom-up approach and color scheme for each dimension

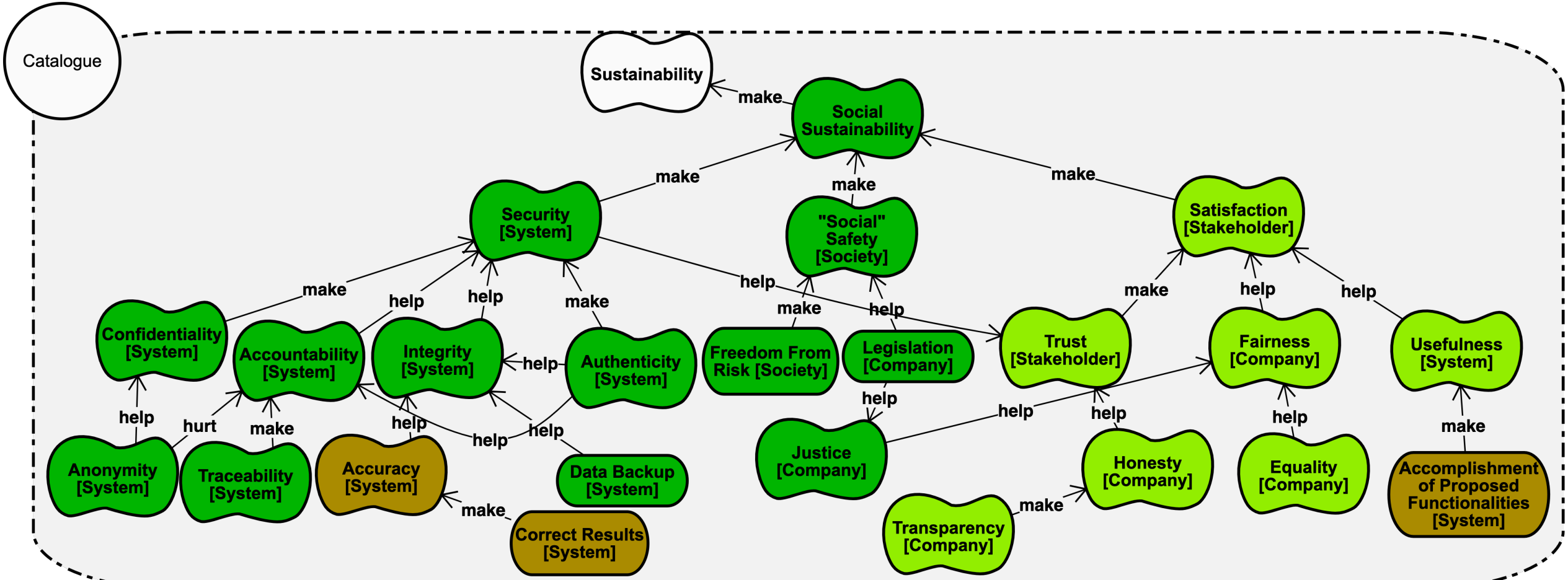
piStar Tool

- **File**
- **Add**
- **Options**
- **Help**

Development Methodology



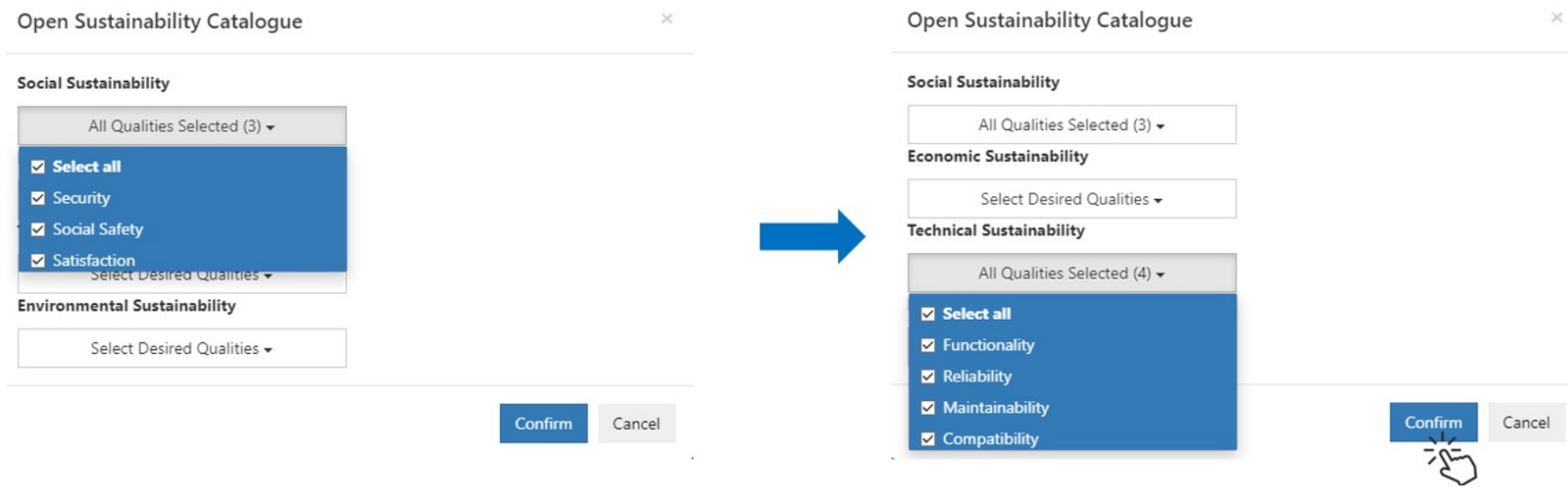
Social Sustainability Catalog

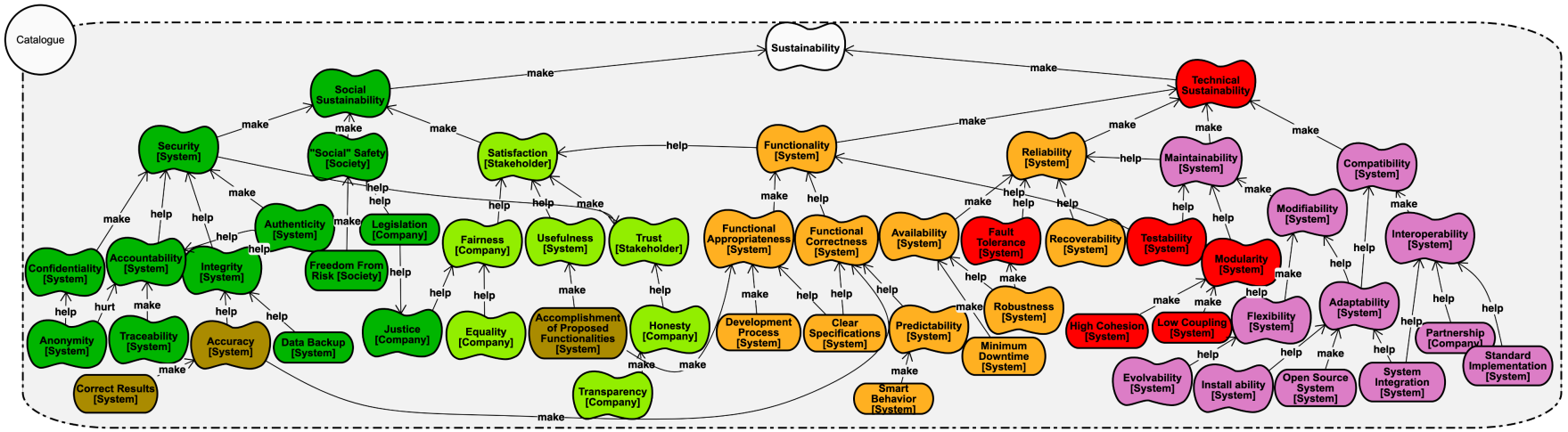


IMPLEMENTATION| Enhanced user experience by developing three plugins

Plugins

- **Labels**
  - Element
  - Color
- **Configurability**



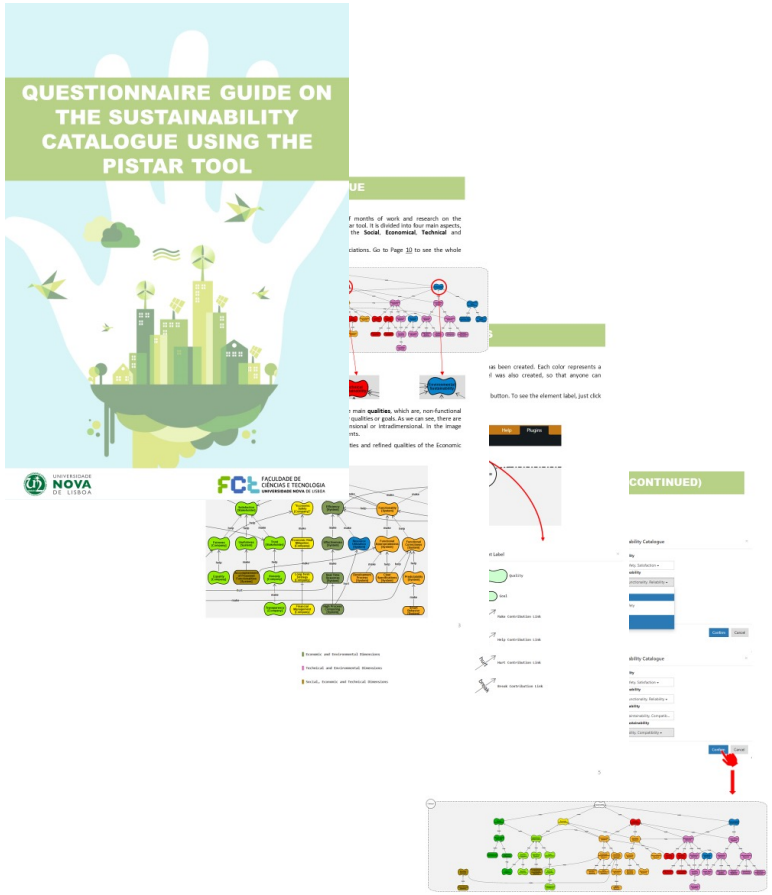


05

EVALUATION

EVALUATION | Questionnaire and guide about/for the sustainability catalogue to our participants

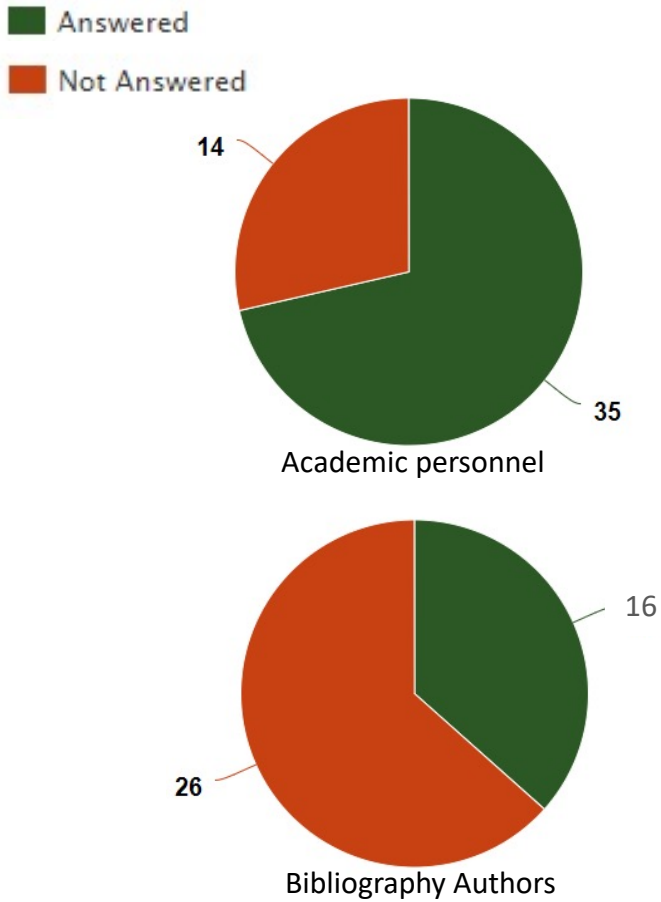
Guide



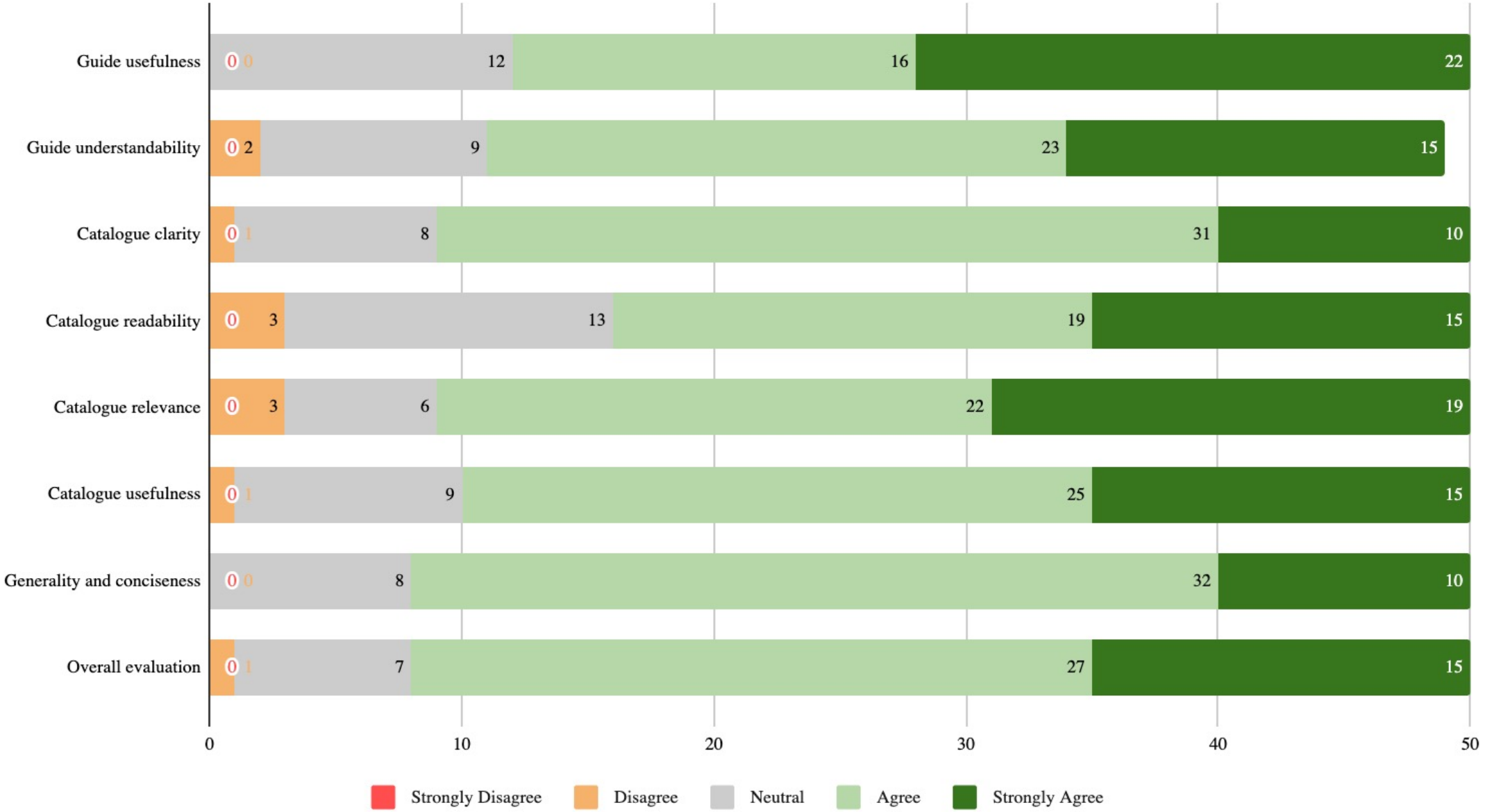
Questionnaire

- Introduction
- Personal Data
- Guide Questions
- Catalogue Questions
- Qualitative Questions

Participant Selection



EVALUATION| Considered responses from all participants and discussed and compared the results



06

CONCLUSIONS & FUTURE WORK

- Sustainability is a key topic for the future of our world
- Lack of reusability approaches regarding sustainable software
- The sustainability catalogue accommodates various sustainability dimensions
- The evaluation results were promising

Future Work|new avenues

- Address the remaining sustainability dimensions (environmental, economic, individual)
- Improve catalog's configurability to allow selection of refined qualities
- Sustainability web-application portal
- Integrate a configured model with specific problem domain models


THANK YOU