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A Guidance System for Selecting an Appropriate Eco-Design Checklist in the Early Stages of Product Development

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Agenda

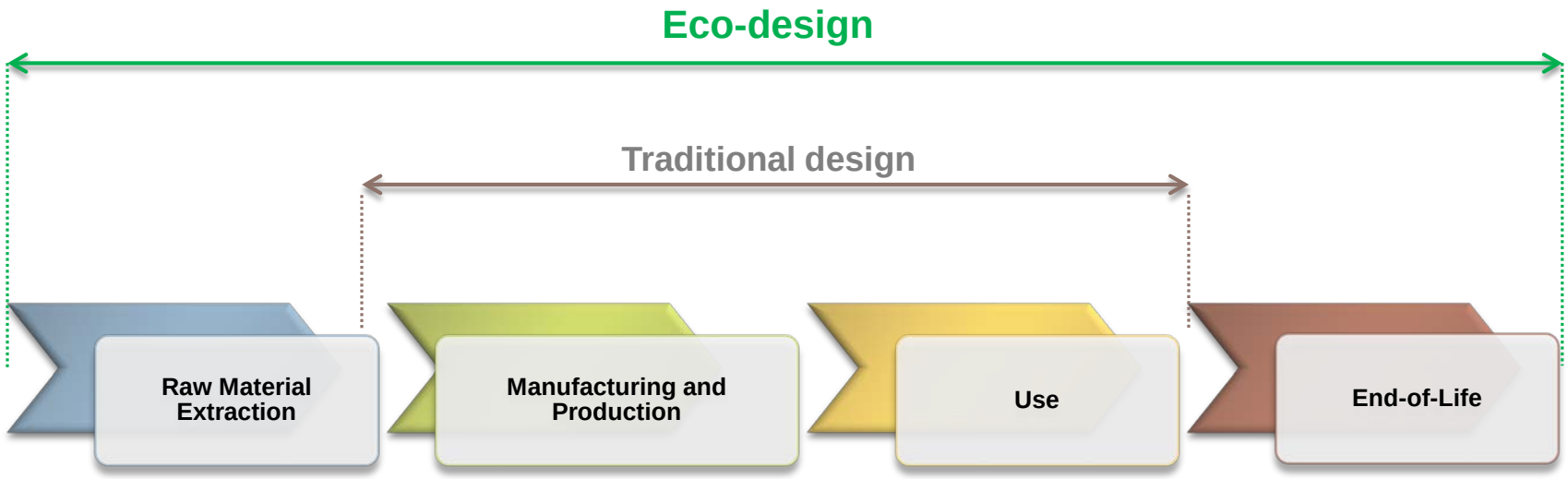
I.	Background
II.	Objectives of Research
III.	Problem Statement
IV.	Research Approach
V.	Case Study
VI.	Discussion

Background


Environmental Performance of Products
Shift
Treat Existing Waste
Decrease Existing Emission
Repair Technology
End-of-Pipe Solution

Background

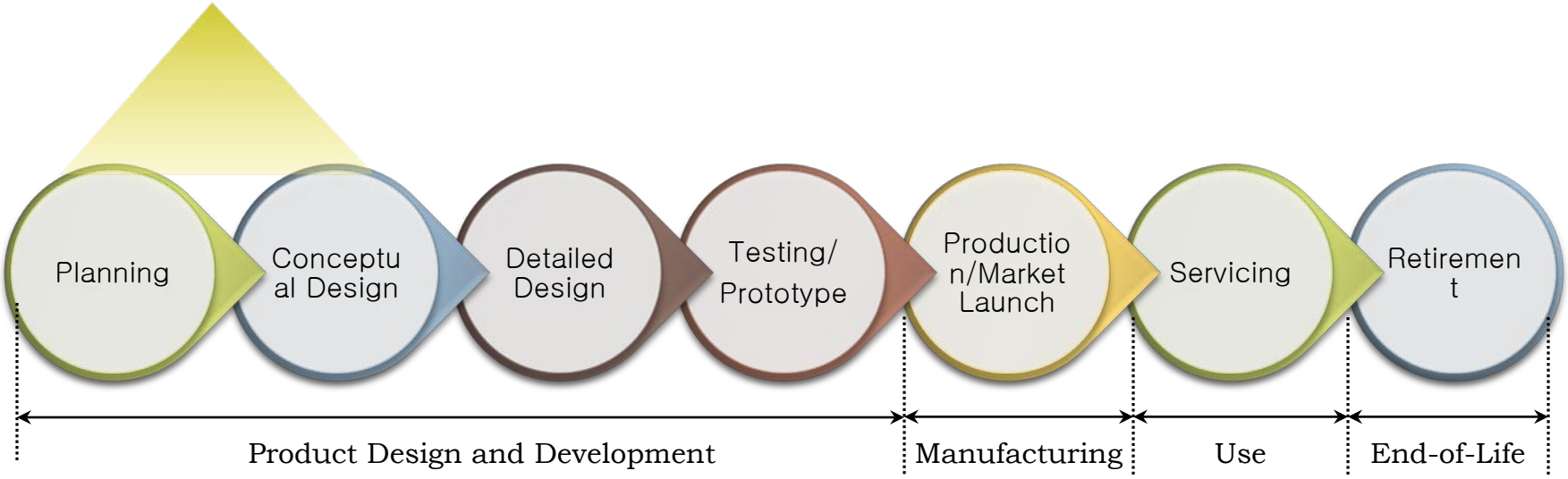
- Traditional design vs. Eco-design (DFE)



- **Life Cycle Thinking** is the core of Eco-design

Problem Statement

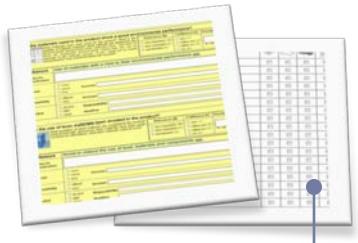
- A **plenty of eco-design tools** for addressing the environmental impacts of products are existed
- Majority of the eco-design tools are applied in **later stages** of product design and development process
- Environmental impacts of products must be incorporated at **the early stages** of new product design and development

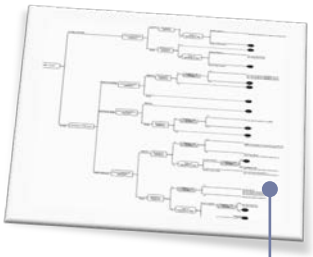


Objectives of Research

- Develop a structured **taxonomy of existing Eco-design tools**
- Identify eco-design tools that can be applied at **the early stages** of product design and development process
- Identify **essential features** of existing Eco-design checklists
- Propose an **Eco-design checklist selection guide** to help product designers

Research Approach



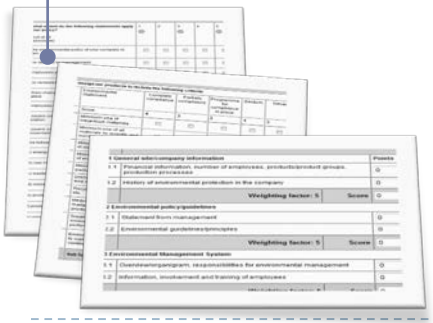


1 **Review Existing Eco-Design Tools**

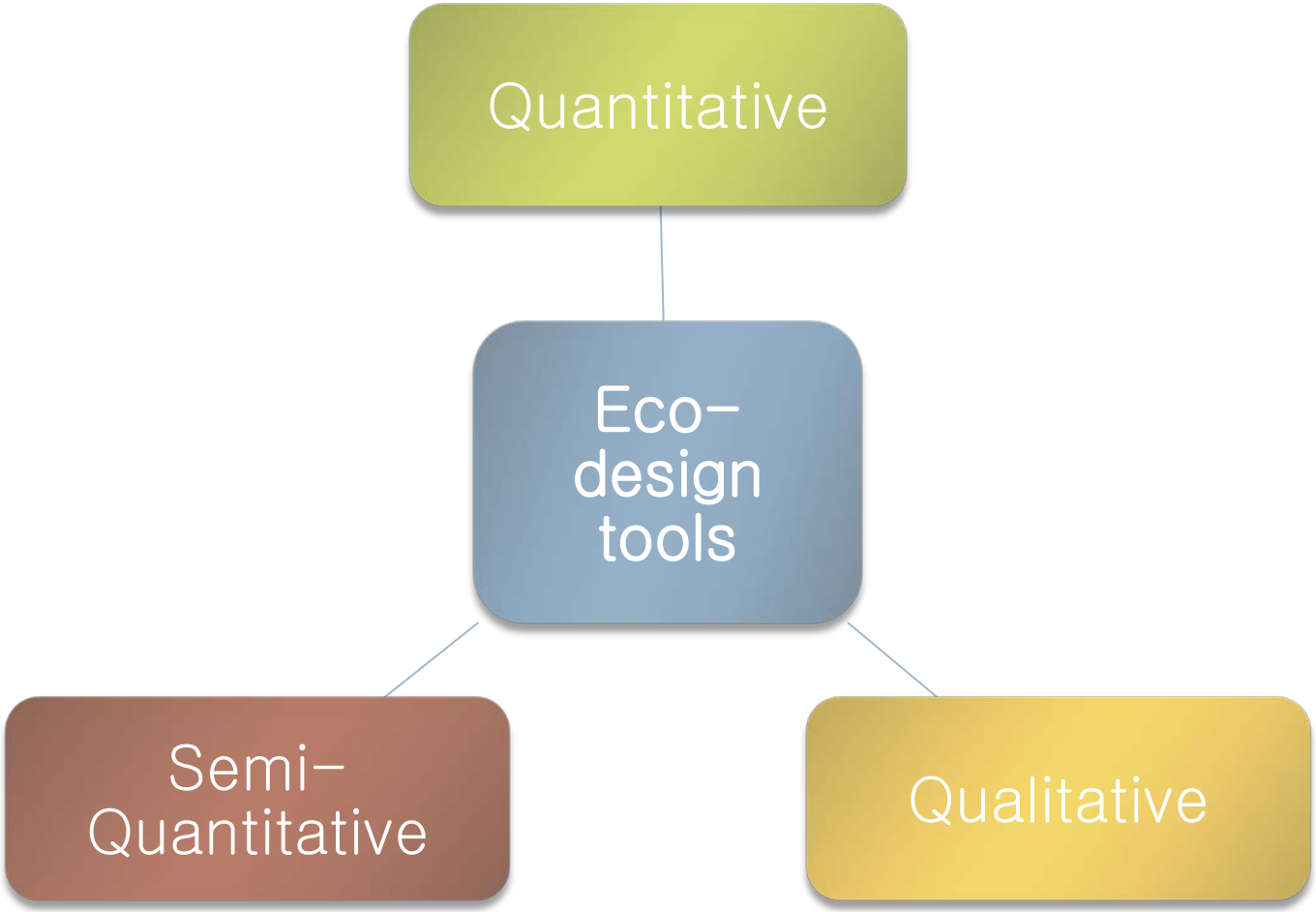
2 **Identify Applicable Tools at the Early Stages of Product Design**

3 **Analyze Existing Eco-Design Checklists**

4 **Develop an Eco-Design Checklists Selection Guide**



Step 1: Review Existing Eco-Design Tools



Step 1: Review Existing Eco-Design Tools

- More than 100 Existing Eco-Design Tools

Category	Tool Type	Tool Name
Quantitative	Analytical	LCA
		…
	Accounting-Based	Cost-Benefit Analysis (CBA)
		Life-Cycle Cost (LCC) Analysis
		Eco-Value Analysis (Eco-VA)
		…
	Input/Output-Driven	Substance Flow Analysis (SFA)
		Environmental Input-Output Analysis (IOA)
		Energy and Material Flow Analyses (EMFA)
		…

Step 1: Review Existing Eco-Design Tools

Category	Tool Type	Tool Name
Semi-Quantitative	Matrices	MET Matrix
		AT&T Matrix and Target Plot
		Boeing Process Environmental Matrix
		…
	Assessment-Based	Eco-Estimator
		Cumulative Energy Demand Analysis (CED)
		Environmental Impact Assessment (EIA)
		Strategic Environmental Assessment (SEA)
		Environmental Risk Assessment (ERA)
		Environmental Effect Analysis (EEA)
		…

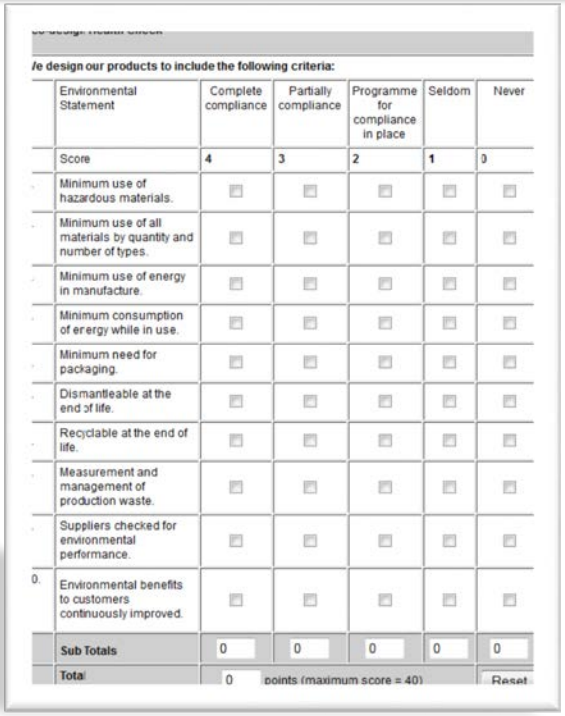
Step 1: Review Existing Eco-Design Tools

Category	Tool Type	Tool Name
Qualitative	Matrices	Dominance Matrix
		Eco Design Priority Matrix
		…
	Network Diagrams	Eco-Compass
		Spiderdiagram
		…
	Manuals and Guidelines	Ecodesign Navigator
		Ten Golden Rules
		…
	Checklists	The EcoDesign Checklist
		Eco-Design Health Check
		ECODESIGN PILOT
		…

Step 2: Identify Applicable Tools at the Early Stages of Product Design

Scope

Eco-design checklists



/e design our products to include the following criteria:

	Environmental Statement	Complete compliance	Partially compliance	Programme for compliance in place	Seldom	Never
	Score	4	3	2	1	0
	Minimum use of hazardous materials.	☐	☐	☐	☐	☐
	Minimum use of all materials by quantity and number of types.	☐	☐	☐	☐	☐
	Minimum use of energy in manufacture.	☐	☐	☐	☐	☐
	Minimum consumption of energy while in use.	☐	☐	☐	☐	☐
	Minimum need for packaging.	☐	☐	☐	☐	☐
	Dismantleable at the end of life.	☐	☐	☐	☐	☐
	Recyclable at the end of life.	☐	☐	☐	☐	☐
	Measurement and management of production waste.	☐	☐	☐	☐	☐
	Suppliers checked for environmental performance.	☐	☐	☐	☐	☐
0.	Environmental benefits to customers continuously improved.	☐	☐	☐	☐	☐
	Sub Totals	0	0	0	0	0
	Total	0 points (maximum score = 40)				Reset

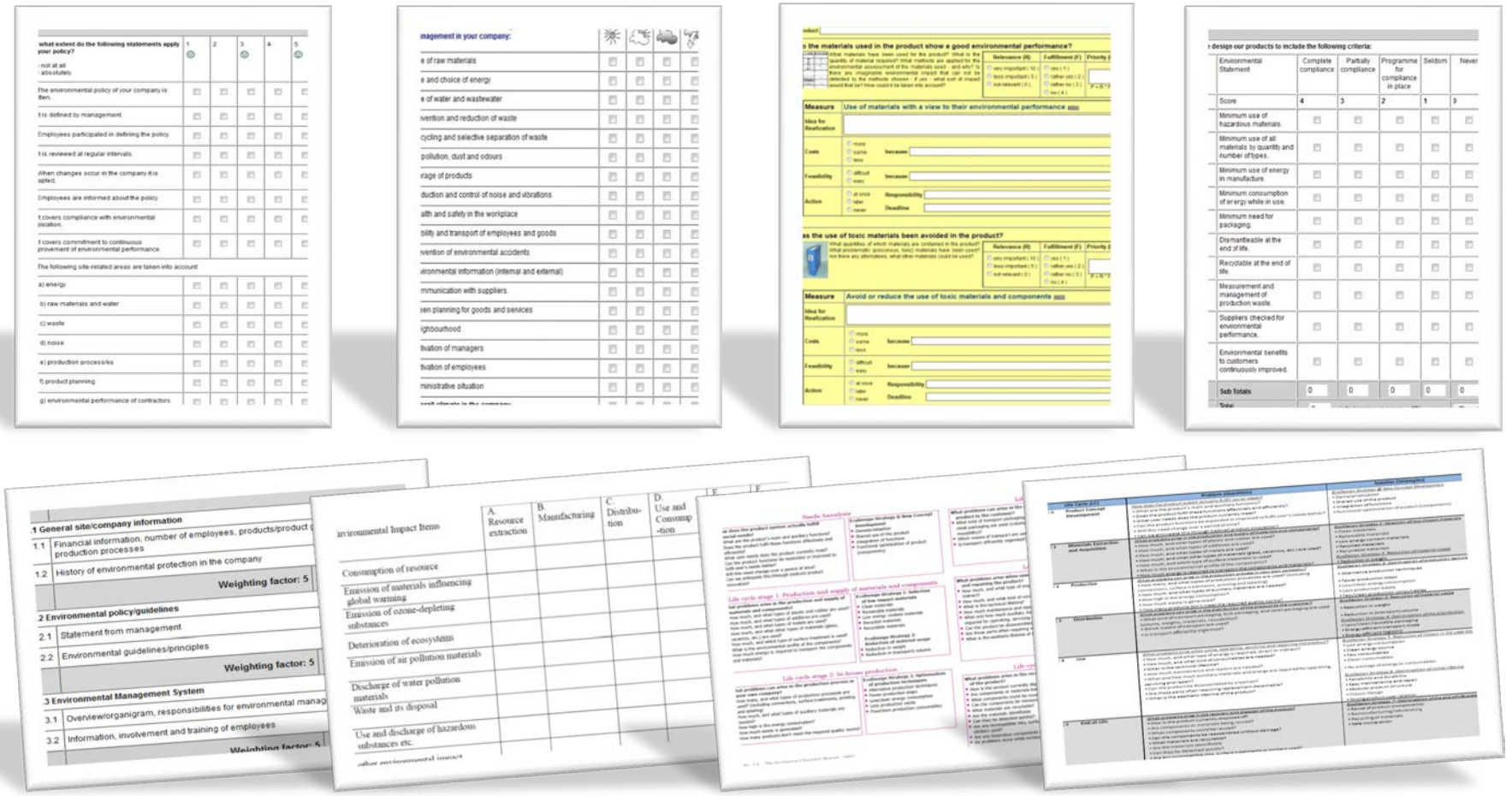
Step 2: Identify Applicable Tools at the Early Stages of Product Design

- Why "Eco-design checklists"?
  - Lack of detailed information at the **early stages of product design**
  - "**Eco-design checklist**" tools are preferred for quick evaluation and consideration of environmental impacts

Step 3: Analyze Existing Eco-Design Checklists

Step 3: Analyze Existing Eco-Design Checklists

- Review existing eco-design checklists critically



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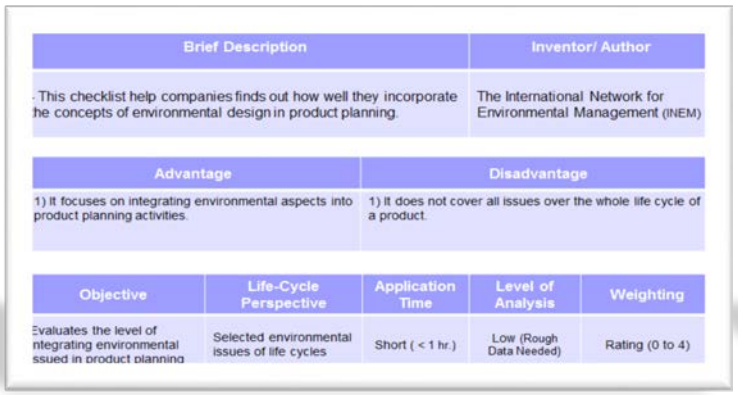
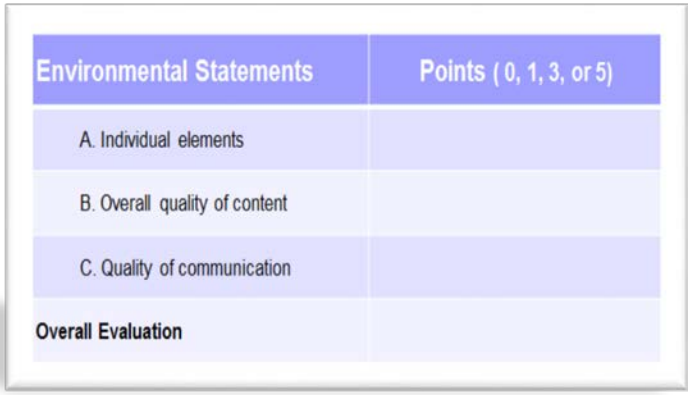


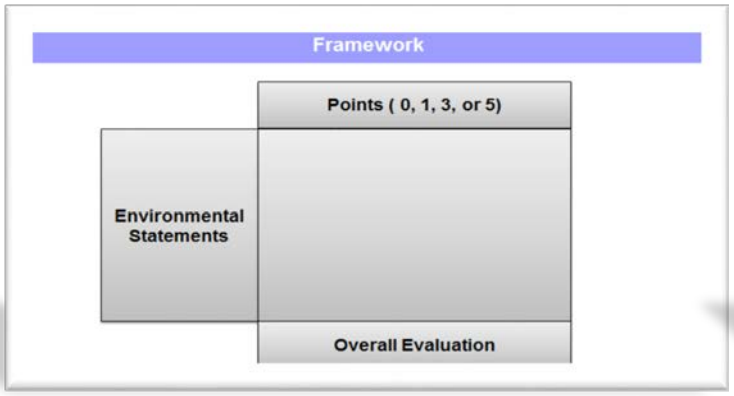
Brief Description	Inventor/ Author
This checklist help companies finds out how well they incorporate the concepts of environmental design in product planning.	The International Network for Environmental Management (INEM)

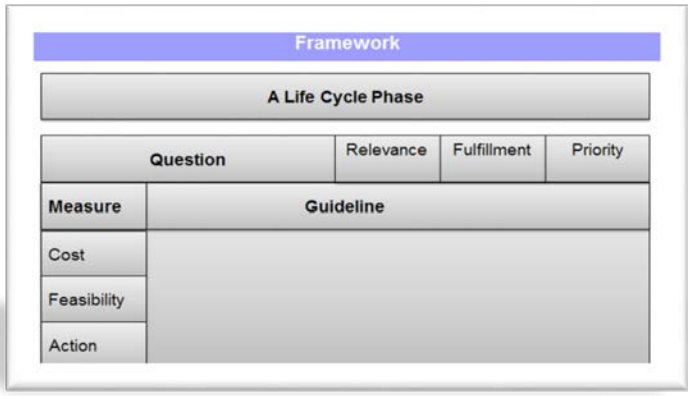
Advantage	Disadvantage
1) It focuses on integrating environmental aspects into product planning activities.	1) It does not cover all issues over the whole life cycle of a product.

Objective	Life-Cycle Perspective	Application Time	Level of Analysis	Weighting
Evaluates the level of integrating environmental issued in product planning	Selected environmental issues of life cycles	Short (< 1 hr.)	Low (Rough Data Needed)	Rating (0 to 4)



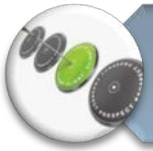
Environmental Statements	Points (0, 1, 3, or 5)
A. Individual elements	
B. Overall quality of content	
C. Quality of communication	
Overall Evaluation	



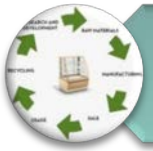


Step 3: Analyze Existing Eco-Design Checklists

- Develop five key questions to identify features of existing eco-design checklists

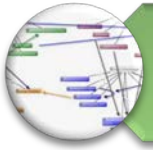


1) What is the target of assessment?

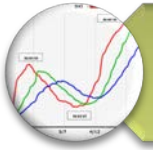


2) What is the coverage of life cycle span?

3) What type of input is needed?



4) What level of analysis is required?



5) What type of output is demanded?

Step 3: Analyze Existing Eco-Design Checklists

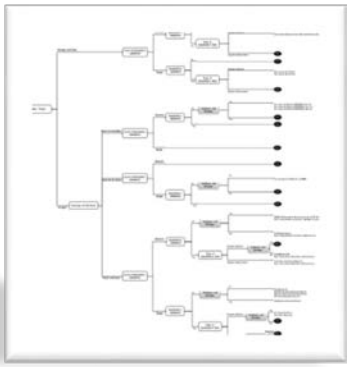
- Identify essential features of existing eco-design checklists

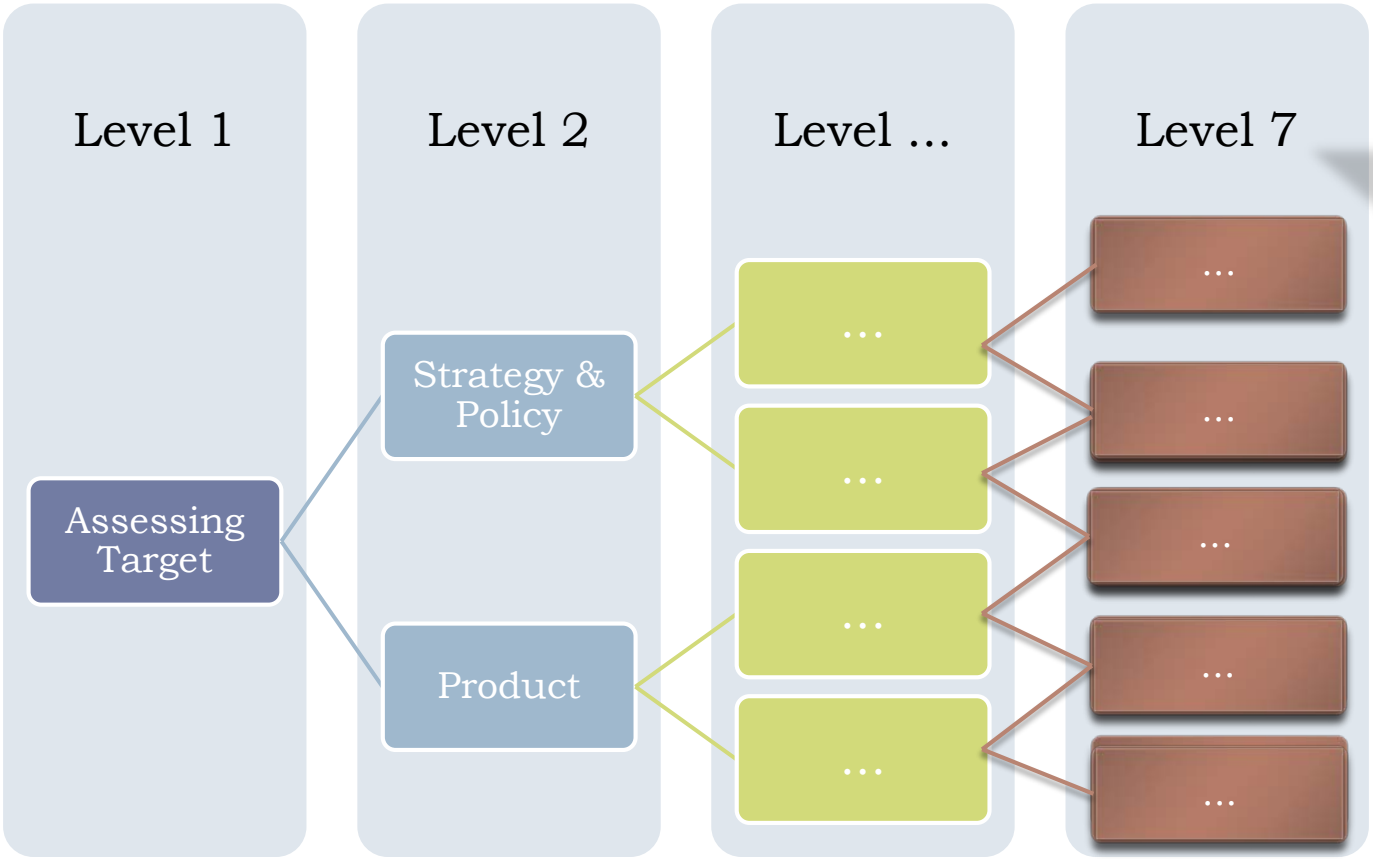
Step 3: Analyze Existing Eco-Design Checklists

- Analyze all existing eco-design checklists in-depth

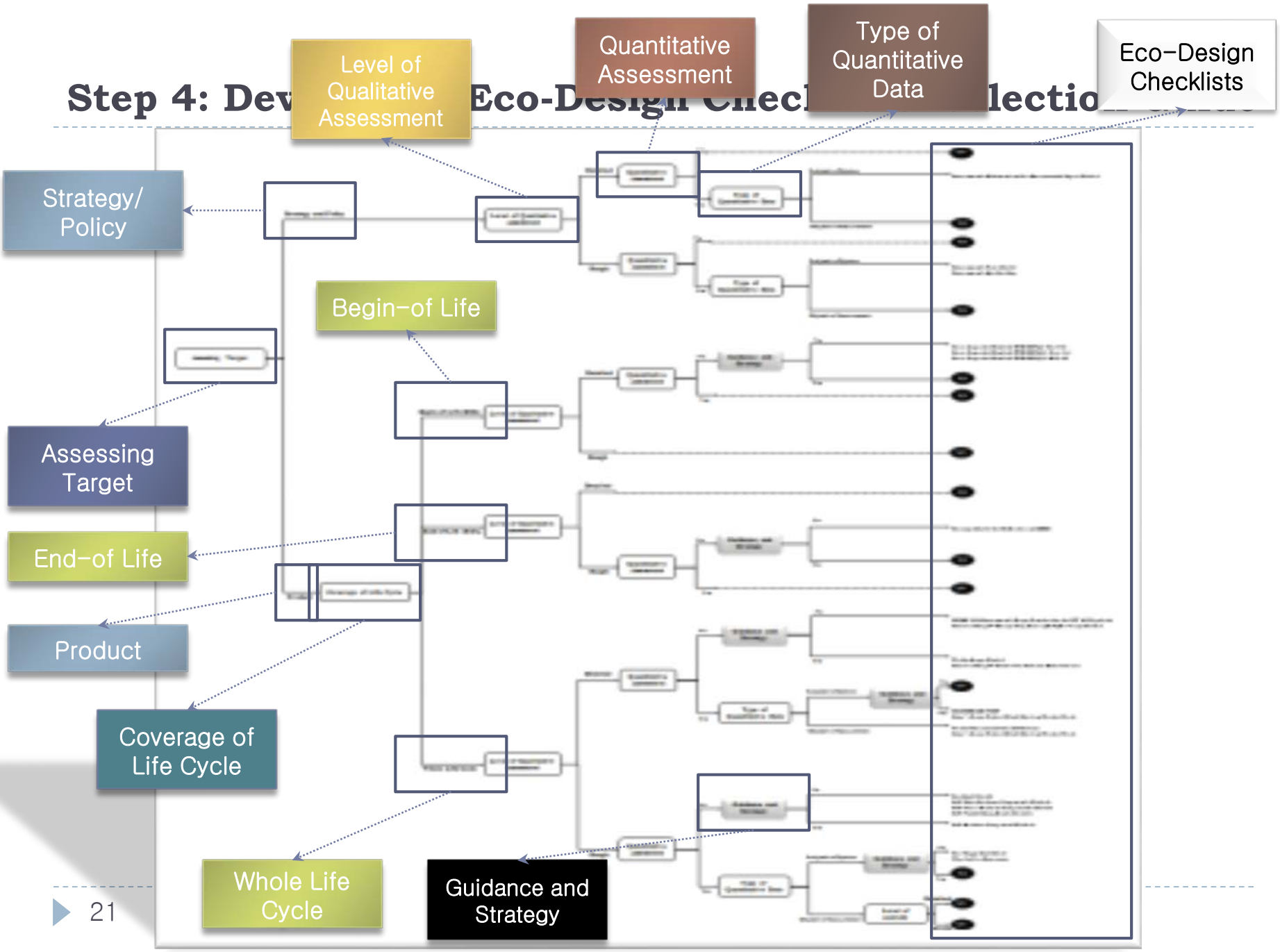
No	Eco-Design Checklist	Assessing Target	Coverage of Life Cycle	Screening			Guidance & Strategy
				Qualitative	Quantitative		
					Subjective Opinion	Objective Measurement	
1	ECODESIGN PILOT	Product	Whole Life Cycle	Detailed (216)	Rating	–	Yes (216)
2	Volvo's Corporate Standard	Product	Material Selection	Detailed (78)	–	–	–
21	Environmental Policy Checklist	Corporate Policy	–	Rough (20)	Rating	–	–

Step 4: Develop An Eco-Design Checklists Selection Guide



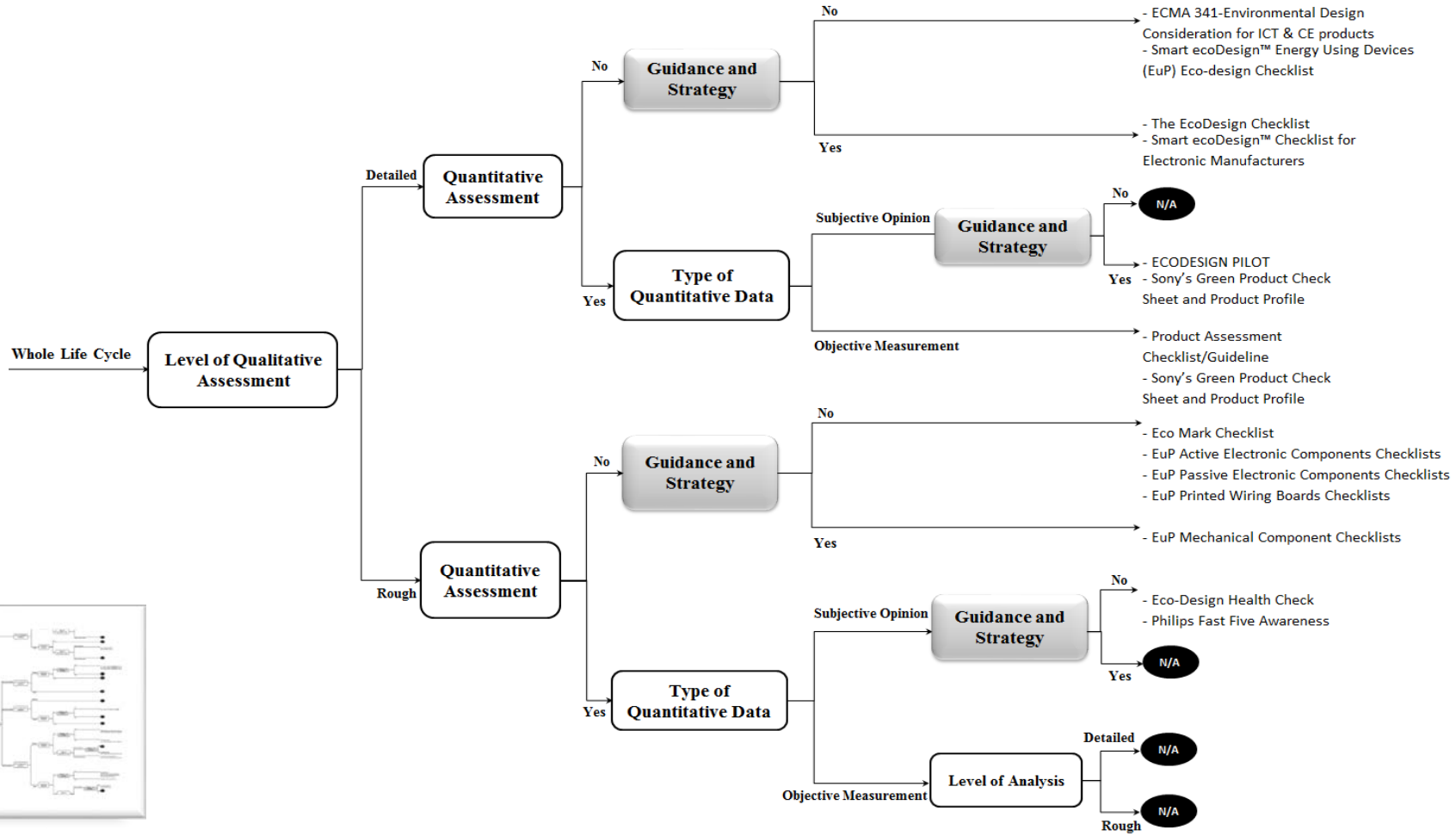


Step 4: Dev Eco-Design Checl lectio



Step 4: Develop An Eco-Design Checklists Selection Guide

- How to Apply the Selection Guide:



Discussion

- This research:
  - Developed a structured **taxonomy of Eco-design tools**;
  - Identified eco-design tools that can be applied at **the early stages** of product design and development process;
  - Distinguished **essential features** of existing Eco-design checklists; and
  - Proposed an **Eco-design checklists selection guide** to help product designers

- Future Research:
  - Extend Eco-Design Checklists to "**Sustainable Design Checklists**"

Q & A

Thank You For Your Attention!