A diagram of a company's rating

Description automatically generated

**Clases:**

1. **SustainabilityRating**: Representa las etiquetas de sostenibilidad (A-G).
2. Sustainabilitycategory con **hasSustainabilityRating**
   * **devicesustainabilityCategory**: Clase base para todas las categorías de características.
3. **RawMaterialCategory**: Subclase de Category que representa la categoría de materia prima.
   * **MaterialOrigin**: Subclase de RawMaterialCategory que representa la subcategoría de origen del material.
   * **MaterialExtraction**: Subclase de RawMaterialCategory que representa la subcategoría de extracción de material.
   * **MaterialEfficiency**: Subclase de RawMaterialCategory que representa la subcategoría de eficiencia del material.
   * **RecycledMaterialContent**: Subclase de RawMaterialCategory que representa la subcategoría de contenido de material reciclado.
   * **HazardousSubstances**: Subclase de RawMaterialCategory que representa la subcategoría de sustancias peligrosas.

(Repetir el mismo patrón para las demás categorías)

1. **Device**: Clase que representa un dispositivo IoT. Con **hasSustainabilityRating**
2. **Securitymechanim con hasSustainabilityRating**

**Object Properties:**

1. **hasSustainabilityRating**: Relaciona un dispositivo con su etiqueta de sostenibilidad.
2. **hasSustainabilityCategory**: Relaciona un dispositivo con una categoría, igual podemos separar a deviceHas…. Y securityMechanismHas…

**Data Properties:**

1. **hasAttributeValue**: Representa los valores de las subcategorías, esto habria que hacer uno por cada enumerado? Entiendo que podré usar la misma propiedad pero luego enlazarla con datatypes distintos
2. **hasScore**: Representa la puntuación asignada a una subcategoría.
3. a rdfs:Datatype ;
4. owl:onDatatype xsd:integer ;
5. owl:withRestrictions (
6. [ xsd:minInclusive "0"^^xsd:integer ]
7. [ xsd:maxInclusive "100"^^xsd:integer ]

)

**Ejemplo de Instancias:**

* **iPhone15**: Instancia de la clase Device.
* **A\_rating**: Instancia de la clase SustainabilityRating con el valor "A".
* **RawMaterial**: Instancia de la clase RawMaterialCategory.
* **MaterialOrigin**: Instancia de la subclase MaterialOrigin.
* **Recycled**: Instancia de la subclase MaterialOrigin con el valor "Recycled".

Modelo

| Category | Subcategory | Description | Data Type |
| --- | --- | --- | --- |
| Raw Material | Material Origin | Types of materials used | Enumerated values: Recycled, Renewable, Conflict |
|  | Material Extraction | Environmental, social, and economic impact of material extraction. | Score: 0-100 |
|  | Material Efficiency | Efficiency in material usage, design optimization for material use. | Score: 0-100 |
|  | Recycled Material Content | Percentage of recycled materials used in the device. | Percentage: 0-100% |
|  | Use of Hazardous and Restricted Substances | Presence of hazardous substances, adherence to regulations like RoHS, REACH. | Enumerated values: Compliant, Non-Compliant |
| Manufacturing | CO2 Emissions | CO2 emissions during production. | Score: 0-100 based on CO2 equivalent |
|  | Water Consumption | Efficiency and sources of water used in production. | Score: 0-100 based on liters or cubic meters |
|  | Renewable Energy Usage | Percentage of renewable energy used in manufacturing processes. | Percentage: 0-100% |
|  | Waste Treatment | Recycling and disposal of production waste. | Score: 0-100 based on efficiency |
| Packaging | Packaging Materials | Types of packaging materials used | Enumerated values: Recyclable, Biodegradable, Reusable |
|  | Packaging Efficiency | Optimization of material and size to reduce waste. | Score: 0-100 |
|  | Sustainability Information | Labeling with recycling and disposal information. | Score: 0-100 based on the presence of information |
| Transport | Transport Mode | Efficiency of transportation modes used. | Enumerated values: Air, Sea, Land |
|  | Logistics Optimization | Measures to reduce transportation distance, shipment consolidation. | Score: 0-100 |
|  | Transport Packaging | Reduction in volume and weight for transport efficiency. | Score: 0-100 |
| Usage | Energy Efficiency | Energy consumption during normal use. | Score: 0-100 based on watts or kilowatt-hours |
|  | Durability | Includes Physical Resistance and Estimated Life Span. | Score: 0-100 for Physical Resistance, Range in years for lifespan |
|  | Repairability | Ease of repair, availability of spare parts. | Score: 0-100 |
|  | Software Updates | Long-term support impact on efficiency and functionality. | Score: 0-100 |
| Spare Parts | Availability | Ease of access to spare parts. | Score: 0-100 |
|  | Compatibility | Ability to use spare parts from various sources or models. | Score: 0-100 |
|  | Sustainability of Spare Parts | Materials and manufacturing processes for spare parts. | Score: 0-100 |
| End of Life | Recyclability | Ease of disassembly, material sorting. | Score: 0-100 |
|  | Return Programs | Initiatives for returning the device to the manufacturer or recycling points. | Score: 0-100 |
|  | Reusability | Potential for component or entire device reuse. | Score: 0-100 |

Reglas

| **Sustainability Rating** | **Rules** |
| --- | --- |
| **A** | Si todas las categorías tienen al menos una etiqueta A o B, entonces el dispositivo recibe una etiqueta de sostenibilidad A. |
| **B** | Si todas las categorías tienen al menos una etiqueta B o C, entonces el dispositivo recibe una etiqueta de sostenibilidad B. |
| **C** | Si todas las categorías tienen al menos una etiqueta C o D, entonces el dispositivo recibe una etiqueta de sostenibilidad C. |
| **D** | Si todas las categorías tienen al menos una etiqueta D o E, entonces el dispositivo recibe una etiqueta de sostenibilidad D. |
| **E** | Si todas las categorías tienen al menos una etiqueta E o F, entonces el dispositivo recibe una etiqueta de sostenibilidad E. |
| **F** | Si todas las categorías tienen al menos una etiqueta F o G, entonces el dispositivo recibe una etiqueta de sostenibilidad F. |
| **G** | Si todas las categorías tienen al menos una etiqueta G, entonces el dispositivo recibe una etiqueta de sostenibilidad G. |

RAW MATERIAL

| **Sustainability Rating** | **Material Origin** | **Material Extraction Score** | **Material Efficiency Score** | **Recycled Material Content** | **Use of Hazardous and Restricted Substances** |
| --- | --- | --- | --- | --- | --- |
| **A** | Renewable | 81-100 | 81-100 | >80% | Compliant |
| **B** | Recycled | 61-80 | 61-80 | 60-80% | Compliant |
| **C** | Recycled | 41-60 | 41-60 | 40-59% | Compliant |
| **D** | Recycled/Renewable | 21-40 | 21-40 | 20-39% | Compliant |
| **E** | Conflict | 11-20 | 11-20 | 10-19% | Non-Compliant |
| **F** | Conflict | 1-10 | 1-10 | 1-9% | Non-Compliant |
| **G** | Conflict | 0 | 0 | 0% | Non-Compliant |

MANUFACTURING

| **Sustainability Rating** | **CO2 Emissions Score** | **Water Consumption Efficiency** | **Renewable Energy Usage** | **Waste Treatment Efficiency** |
| --- | --- | --- | --- | --- |
| **A** | Very Low (81-100) | Very Efficient (81-100) | >80% Renewable | Very Efficient (81-100) |
| **B** | Low (61-80) | Efficient (61-80) | 60-80% Renewable | Efficient (61-80) |
| **C** | Moderate (41-60) | Moderately Efficient (41-60) | 40-59% Renewable | Moderately Efficient (41-60) |
| **D** | Medium (21-40) | Average Efficiency (21-40) | 20-39% Renewable | Average Efficiency (21-40) |
| **E** | High (11-20) | Low Efficiency (11-20) | 10-19% Renewable | Low Efficiency (11-20) |
| **F** | Very High (1-10) | Very Low Efficiency (1-10) | 1-9% Renewable | Very Low Efficiency (1-10) |
| **G** | Extremely High (0) | No Efficiency (0) | 0% Renewable | No Efficiency (0) |

PACKAGING

| **Sustainability Rating** | **Packaging Materials** | **Packaging Efficiency** | **Sustainability Information** |
| --- | --- | --- | --- |
| **A** | Recyclable, Biodegradable, Reusable | Very Efficient (81-100) | Comprehensive (81-100) |
| **B** | Recyclable, Biodegradable, Reusable | Efficient (61-80) | Good (61-80) |
| **C** | Recyclable, Biodegradable, Reusable | Moderately Efficient (41-60) | Moderate (41-60) |
| **D** | Recyclable, Biodegradable, Reusable | Average Efficiency (21-40) | Minimal (21-40) |
| **E** | Recyclable, Biodegradable, Reusable | Low Efficiency (11-20) | Low (11-20) |
| **F** | Recyclable, Biodegradable, Reusable | Very Low Efficiency (1-10) | Very Low (1-10) |
| **G** | Non-Recyclable (0) | No Efficiency (0) | None (0) |

TRANSPORT

| **Sustainability Rating** | **Transport Mode** | **Logistics Optimization** | **Transport Packaging** |
| --- | --- | --- | --- |
| **A** | Land, Sea, Air | Highly Optimized (81-100) | Very Efficient (81-100) |
| **B** | Land, Sea, Air | Optimized (61-80) | Efficient (61-80) |
| **C** | Land, Sea, Air | Moderately Optimized (41-60) | Moderately Efficient (41-60) |
| **D** | Land, Sea, Air | Average Optimization (21-40) | Average Efficiency (21-40) |
| **E** | Land, Sea, Air | Low Optimization (11-20) | Low Efficiency (11-20) |
| **F** | Land, Sea, Air | Very Low Optimization (1-10) | Very Low Efficiency (1-10) |
| **G** | Land, Sea, Air | No Optimization (0) | No Efficiency (0) |

USAGE

| **Sustainability Rating** | **Energy Efficiency** | **Durability** | **Repairability** | **Software Updates** |
| --- | --- | --- | --- | --- |
| **A** | High Efficiency (81-100) | Highly Durable (81-100) | Highly Repairable (81-100) | Comprehensive (81-100) |
| **B** | Efficient (61-80) | Durable (61-80) | Repairable (61-80) | Regular (61-80) |
| **C** | Moderate Efficiency (41-60) | Moderately Durable (41-60) | Moderately Repairable (41-60) | Occasional (41-60) |
| **D** | Average Efficiency (21-40) | Average Durability (21-40) | Average Repairability (21-40) | Infrequent (21-40) |
| **E** | Low Efficiency (11-20) | Low Durability (11-20) | Low Repairability (11-20) | Rare (11-20) |
| **F** | Very Low Efficiency (1-10) | Very Low Durability (1-10) | Very Low Repairability (1-10) | Minimal (1-10) |
| **G** | Inefficient (0) | Non-Durable (0) | Non-Repairable (0) | None (0) |

SPARE PARTS

| **Sustainability Rating** | **Availability** | **Compatibility** | **Sustainability of Spare Parts** |
| --- | --- | --- | --- |
| **A** | Highly Available (81-100) | Highly Compatible (81-100) | Highly Sustainable (81-100) |
| **B** | Available (61-80) | Compatible (61-80) | Sustainable (61-80) |
| **C** | Moderately Available (41-60) | Moderately Compatible (41-60) | Moderately Sustainable (41-60) |
| **D** | Limited Availability (21-40) | Limited Compatibility (21-40) | Limited Sustainability (21-40) |
| **E** | Rarely Available (11-20) | Rarely Compatible (11-20) | Unsustainable (11-20) |
| **F** | Very Rarely Available (1-10) | Very Rarely Compatible (1-10) | Very Unsustainable (1-10) |
| **G** | Not Available (0) | Not Compatible (0) | Not Sustainable (0) |

END OF LIFE

| **Sustainability Rating** | **Recyclability** | **Return Programs** | **Reusability** |
| --- | --- | --- | --- |
| **A** | Highly Recyclable (81-100) | Comprehensive (81-100) | Highly Reusable (81-100) |
| **B** | Recyclable (61-80) | Good (61-80) | Reusable (61-80) |
| **C** | Moderately Recyclable (41-60) | Moderate (41-60) | Moderately Reusable (41-60) |
| **D** | Limited Recyclability (21-40) | Minimal (21-40) | Limited Reusability (21-40) |
| **E** | Low Recyclability (11-20) | Rare (11-20) | Low Reusability (11-20) |
| **F** | Very Low Recyclability (1-10) | Very Rare (1-10) | Very Low Reusability (1-10) |
| **G** | Non-Recyclable (0) | None (0) | Not Reusable (0) |