An ICT Platform Facilitating Circular Economy Business Models

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Introduction

The CIRC4Life project aims to develop and implement a circular economy approach through three circular economy business models. In order to support these three business models, around the whole value chain, an ICT platform is created, including various end user tools; central and distributed databases; and external backends. We present the methodology for the system design, the architecture of the ICT platform as well as the main ICT components of the system.

ICT Platform Design

Taking into consideration that the ICT platform is designed to serve new business models that have not yet been verified in the market , it was decided to use a Service Oriented Arquitecture (SoA) approach serving the end user parts of the system, whereas by design the system allows local components to use any other preferred architecture . In this direction an Ecosystem of subsystems, with different layers being served by a central platform of SoA architecture was designed and developed .

In this context:
- A data layer is introduced, which comprises all the data providers to the system, including the Escrow Database of the Products and any other legacy data that could be potentially needed by the projected business models (BMs).
- Three independent modules with business logic serve all 3 Circular Economy BMs:
  1. Recycle/Reuse Module, including the recycling bins
  2. Traceability Module
  3. LCA Module

- The Core platform of the system includes all the databases needed, in a harmonized data format, the webservice/ Application Programming Interface manager for service provision and the Access Control manager to ensure security of the whole system.
- Finally, four different end_user environments provide all the interfaces needed by the system users:
  1. End Users Toolbox (Consumer Eco Account, Eco Shopping Module)
  2. Retailer Tool for Eco Accounting
  3. Impact Assessment Tool
  4. Stakeholders Interaction Toolbox

Iterative ICT Design

ICT Components Overview

Retailer Tool for Eco Accounting: Enables the consumer to buy the product at the store and get the related eco information via a receipt showing both the cash payment information and the eco-point information of each item purchased at the check-out point.

End Users Toolbox: Enables the consumer to view the eco-information related to the consumer's purchasing and recycling activities, such as eco-points and sustainable production information,

Impact Assessment Tool: A system to display the impact of various materials and contribute to the design of new products. The system could also provide information about recycling/reuse of materials.

Stakeholder Interaction Toolbox: A system that allows the interactions of stakeholders around the value chain, offering the possibility of matchmaking and exchange of services and materials.

Traceability Module: Capturing interfaces are used to gather data from the partners and load it into the traceability module. Access applications are developed to transform the data and provide APIs to the platform through which it can be used. Traceability data is used to monitor individual products throughout their lifecycle.

Recycle/Reuse Module: This module is used to capture and store online recycling and reuse data of EoL products such as tablets, lights and meat products, and then reward users for the recycling events.

LCA Module: The tool provides the functions to conduct LCA online to analyze the product's environmental/social impacts through their lifecycle, in order to calculate their impact in a standardized format of Eco-points.

Core Platform: A core system backend that handles all the data needed for the eco-Point computation (product purchasing), Eco-Credit computation (product recycling), the user transaction history, as well as a SOA that handles all the services needed by the frontend systems.
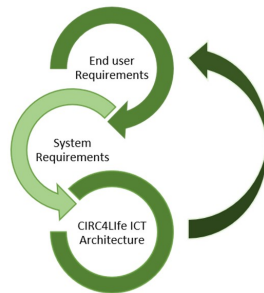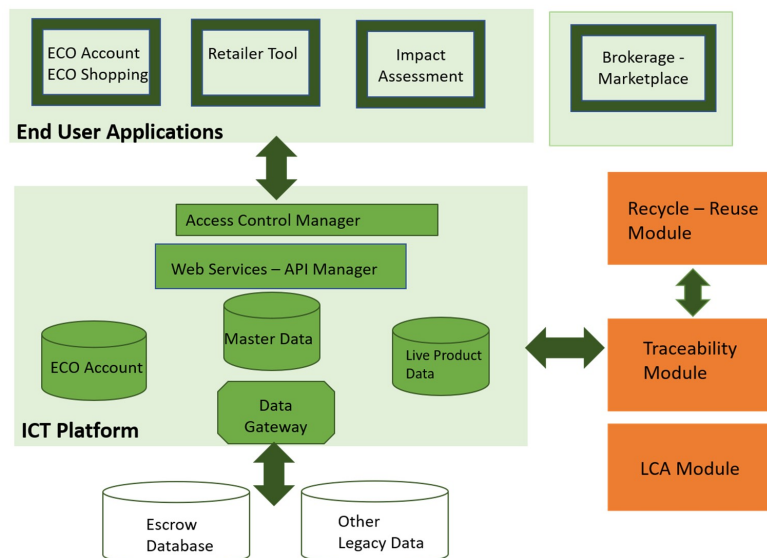
Data Provider: Database and entry systems that handle interaction with external systems and data entry containing product data and supporting resources describing the product and used as an intermediate data input interface to the core platform.

Conclusions

Circular Economy business models require flexible ICT systems that can collect and exchange large amounts of data in a centralized way. SOA is explored as one of the possibilities for serving multiple users across their buying and recycling habits. Through this iterative approach, it was found that Circular Business Models can be better served through modular systems which can adapt to changing user requirements. Furthermore, such an approach allows the Business Models to consider a large variety of data sources and tools, giving them the opportunity to be further refined. Especially for Circular Business Models that require interaction among stakeholders alongside the value chain, this is an additional enabler.

ICT PLATFORM OVERALL ARQUITECTURE

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