



D1.2 CRM efficient PaaS demonstrator 2 – Vacuum cleaner

PaaS (product-as-a-service) is a potential business model for many manufacturers. It enables the manufacturer to keep the ownership of the products giving the opportunity to increase value captured through enhancing their commitment ^[1]. Deliverable 1.2 of the Scandere project is presented in this document: it is a PaaS demonstrator with vacuum cleaners that was developed and deployed for the European markets with help of the project in terms of CRM efficiency.

Science-based solution elements

Existing scientific insights were collected to form a collection of solution elements as a starting point. According to a scientific literature review on developing PaaS offerings ^[2], one of the five challenges for decision making in PaaS design is to choose and design a right business model. Hence, business model aspects were investigated in detail. In doing so, the general business model canvas ^[3] was adopted as a frame to describe the business model elements. Business cases were also collected from scientific literature and complemented by grey literature with special attention to electrical and electronic equipment (EEE) and related product categories; e.g., home appliances, gardening tools, and electric scooters/bikes. The result is shown in Appendix.

PaaS development

Several possible types of PaaS business models were identified after analysing the collected solution elements explained above. General business model canvas has been used for each of the above-mentioned business model variants. Personas ^[4] (related to customer segments) were used and anticipated customer characteristics have been identified using three parameters: geographical location, psychographics, and demographics. All the project partners (BSH contributed with their several functions such as R&D, production, sustainability, and marketing) gave inputs from design, sustainability, regulations, reverse logistics, repair, refurbish, remanufacturing, and recycling. They were actively engaged in the series of ca two-hour workshops, which were organized by Grenoble University because of their project tasks residing on business model design. Different design implications were analysed for each type of business model.

Below are example areas of implications.

- Vacuum cleaner remanufacturing and refurbishment.
- Battery and motor remanufacturing and refurbishment.
- After-use treatment, including reverse logistics.
- Second-hand market for used vacuum cleaners.
- Dismantling and recycling of vacuum cleaners.
- Maintenance.
- Recycling.
- New design of the packaging.
- Cost analysis for both short and long-term contracts.
- Insurance matters for cases of theft.
- Country contexts for the minimum trial time of the vacuum cleaners.

Three types of PaaS offerings have been identified as possible ways:

- Subscription to a vacuum cleaner (pay-per-month),
- Pay-per-use, and
- Component-as-a-Service (CaaS).

Building upon these three types, two promising offerings have been identified: an offering of a vacuum cleaner with a pay-per-month subscription (PaaS) and an offering of only the battery as a pay-per-month subscription (CaaS) with the vacuum cleaner offered separately in the normal one-off sales business model. These two offerings were further elaborated with the business model canvas.

Deployed offerings

A Scandere partner, BSH, has deployed the PaaS offerings of vacuum cleaners with a pay-per-month subscription on Dutch and German markets. The vacuum cleaner models under the PaaS offering are exemplified by Figure 1. These PaaS offerings are a product of choosing an option for each area shown above and demonstrate the viability of the battery-driven vacuum cleaner PaaS offerings on European markets. An example description of

the PaaS offering with the vacuum cleaner model in Figure 1 is shown in Box 1 (Source: <https://www.bluemovement.com/nl-en/plans/vacuum-cleaners/q8a0033888>).



Figure 1. Vacuum cleaner used in demonstration (Source: <https://www.bluemovement.com/nl-en/plans/vacuum-cleaners/q8a0033888>)

Box 1. An example description of the vacuum cleaner PaaS.

The refurbished vacuum delivered to your house can have different features than those described below. Good to know: your vacuum is similar or better.

Check out all the product features or read more about the most frequently asked questions. Changed your mind? You can withdraw from your subscription within 14 days of delivery.

- Reliable service - see Trustpilot
- Track your delivery with Track & Trace via DHL/PostNL
- Easy return after the subscription ends or choose to purchase the appliance
- No need to worry about repairs, we'll take care of it - see the Terms and Conditions
- Find out which repairs are covered and which are not
- Fixed monthly fee
- One time fee of € 29

Delivery in 2-5 business days

Condition as refurbished

Duration

- 4+ years: € 12.99/month
- 2+ years: € 14.99/month

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Appendix

Subject	Title	Authors	Executive summary	Published year
PaaS Example	New subscription service "KINTO Unlimited" to be offered from the new Pruis	Toyota Motors and its partner	Commercial example, Toyota offering subscription service which includes all expenses, insurance etc. into a monthly fee. This monthly fee includes access to some driver aids and interestingly engine oil change based on personal driving. The automobile was designed for easier upgrades that will lead to lower service cost. Services are provided via connectivity, which enables better maintenance and enhance residual values of the automobiles (which will then reduce the subscription fee).	2022
PaaS example	Leasing or buying white goods: comparing manufacturer profitability versus cost to consumer	Patricia van Loon, Charles Delagarde, Luk N. Van Wassenhove & Aleš Mihelič	This paper investigates the profitability of leasing and remanufacturing washing machines, by estimating all the costs for consumer and manufacturer in a PaaS system, and comparing that to a linear equivalent. The results show that the customers benefit more from a premium washing machine PaaS system than manufacturers.	2019
PaaS example	Transition to the circular economy: the story of four case companies	Patricia van Loon & Luk N. Van Wassenhove	This paper discusses the challenges of four companies trying to move to a PaaS model while preserving current profit levels. It describes their business designs, the process they went through, challenges faced, and the eventual outcome.	2020
PaaS theory	Product as a service in the circular economy: The nine critical challenges and how to fix them	Mats Linder, Märta Bergfors, Elin Bergman, Felicia Gustafsson, Emmanouil (Manos) Milathianakis, Shanmuga Kumar, Elin Bergman, Michel Bajuk, Jan Agri	This EU report reviews the main challenges behind the sluggish penetration of PaaS in the market and identifies potential actions by its stakeholders to address them. The nine main challenges have been identified and they fall into one of the following categories: customer acceptance, operational and capability-related costs and financial risk. Each challenge can be met and overcome by the PaaS provider.	2022
PaaS example	Business models and product groups for Product Service Systems (PSS) in the Nordics	Kia Egebæk, Amalie Børglum Ploug Olsen, Iris Secher Kristensen, and Bjørn Bauer	This paper presents existing product service systems (PSS) in the Nordics and identify key product groups suitable for PSS. Analysis of 275 cases of PSS in the Nordics is done based on Arnold Tukker's three categories for PSS - Product-oriented, Use-oriented, and Result-oriented.	2022
PaaS theory	Analysis of the business potential of product-service systems for investment goods	Joris Van Ostaeyen	In this thesis, a theoretical foundation for PSS research is proposed, including a new PSS definition, representation scheme and typology. A Functional Hierarchy Modeling is presented and a generic methodology to evaluate the business potential of a PSS is presented and validated through 5 cases studies.	2014
PaaS theory	A refined typology of product-service systems based on functional hierarchy modeling	Joris Van Ostaeyen, Adriaan Van Horenbeek, Liliane Pintelon, Joost R. Dufloy	In this article a new functional decomposition technique, termed Functional Hierarchy Modeling (FHM), is proposed which allows the analysis and representation of functions of an investment goods with several industrial examples	2013
PaaS theory	Making Functional Sales Environmentally and Economically Beneficial through Product Remanufacturing	Erik Sundin and Bert Bras	This paper connects PaaS with reuse strategies, in this case remanufacturing. It deals with the obstacles and opportunities to combine PaaS with remanufacturing.	2005
PaaS theory	Product design for product/service systems - design experiences from Swedish industry	Erik Sundin, Mattias Lindahl and Winifred Ijomah	This paper deals with examples of PaaS and how well / not-well the products used in the PaaS are being adapted for PaaS. It gives both examples of PaaS and point out challenges with product designs.	2009
PaaS theory	Environmental and economic benefits of Integrated Product Service Offerings quantified with real business cases	Mattias Lindahl, Erik Sundin and Tomohiko Sakao	This paper brings up industry examples of PaaS and calculations for different use scenarios from both economic and environmental perspectives.	2014
PaaS Example	Designing a circular business strategy: 7 years of evolution at a large washing machine manufacturer	van Loon, P., Van Wassenhove, L., Mihelič, A.	This paper explains the evolution of the PaaS model for washing machines from an optimistic initial scenario to a feasible and economically viable PaaS. The main challenges are well described from the company perspective, as well as common traps when moving from linear to circular business model.	2022
PaaS theory	A circular economy business model innovation process for the electrical and electronic equipment sector	Pollard, Jennifer, Mohamed Osmani, Christine Cole, Suzana Grubnic, and James Colwill.	CE business model innovation process is described, with the associated challenges and opportunities and related policy. Framework is presented for circularity indicators for electrical and electronic equipment, helping to ensure that the proposed circular economy actions are measurable.	2021
PaaS theory and example	Assessing the impacts of circular economy: a framework and an application to the washing machine industry	Gianmarco Bressanelli, Marco Perona and Nicola Saccani	A systemic framework to support a simplified evaluation of circular economy scenarios for durable goods (with washing machine case study). The framework adoption aim to reduce the uncertainties which are often an obstacle to the transition towards circular economy.	2019
PaaS Example	Responsible Resource Management in Remanufacturing Framework for Qualitative Assessment in Small and Medium-Sized Enterprises	Paulina Golinska-Dawson, Karolina Werner-Lewandowska and Monika Kosacka-Olejnik	This paper contributes to this research gap by presenting a two-layered framework, which uses the maturity model theory, and it allows for a quick scan of a remanufacturing process. The framework is tested in small and medium-sized enterprises from the automotive industry.	2021
PaaS Example	RETHINKING OWNERSHIP PRODUCER OWNERSHIP MODELS Rethinking ownership - Product ownership models in a circular economy	Annina Orasmaa, Louna Laurila and Henrik Liimatainen	The report presents a vision of rethinking ownership, which outlines how, by 2030, companies will have transitioned from simply selling products to renting, maintenance and returns, thereby taking ownership of products throughout their life cycle. Economic steering methods, legislation and the financial markets will have accelerated the shift to new forms of ownership.	2020
PaaS Example	Vacuum as a service: Electrolux trials new subscription-based business models	Electrolux	Electrolux is kicking off trials of new hardware-as-a-service business models, enabling consumers to subscribe to, rather than purchase.	2019
PaaS Example	Chainable - Kitchen as a service	Circular X	Chainable produces modular, circular and sustainable kitchens as a service for the professional market.	2021
PaaS Example	Aquarea Service + Premium	Panasonic	Panasonic provides PaaS with heatpumps in Europe. Electricity prices (recent increases in Europe) may strengthen users interests in PaaS with flat fees.	2022