Exploring reluctance to circular business models – the case of light as a service

Emma Rex[1*] and *Ulrika* Kron[2,3]

[1]RISE Research Institutes of Sweden, Sustainable Business, Sven Hultins plats 5, 412 58 Gothenburg, Sweden
[2]Chalmers Industriteknik, Sven Hultins plats 1, 412 58 Gothenburg, Sweden
[3]DFDS Logistics Göteborg, Sydatlanten 10, 418 34 Gothenburg, Sweden

Abstract. Selling light as a service is one example of a service-based business model that could enable a more circular economy. However, despite a growing interest to become more circular, there is still hesitation among customers to change the way they meet their need for light. In an ongoing project, we explore this reluctance and seek to identify obstacles and driving forces for large customer organizations to buy light as a service. As a first step, an interview study and a workshop were made to identify current perceptions in a broad range of stakeholders including lighting manufacturers, suppliers of light as a service, light designers and architects, private and public customers, collaborative bodies, and sector organizations. The focus was on large customers (municipalities and property companies) and on indoor lighting in offices and schools in Sweden. Barriers and driving forces could be found in 5 categories: environmental impact, economic consequences, social effects, competence, and roles and responsibilities. The analysis points to the importance of increasing knowledge, reducing uncertainties, and creating trust between actors in the business ecosystem to decrease barriers to change. It also appears extending the value proposition and increasing emphasis on social and user benefits are key for light as a service to become competitive with traditional business models.

1 Introduction

The circular economy aims at increasing resource productivity from a life cycle perspective. At the same time, it challenges the traditional way of doing business and calls for new management practices, including revised business models and changed actor rationales. For example, functional sales business models are expected to provide incentives for manufacturers to make products that last longer and use fewer resources over time. In lighting, this can, for example, be expressed in selling light as a service. However, despite growing interest to become more circular, there is still hesitation among customers to change the way they meet their need for light. A similar observation has been made for the circular economy in general: Despite potential gains implementation is slow in practice [1]. Thus, in

* Corresponding author: emma.rex@ri.se

an ongoing project, we explore customers' reluctance and seek to identify obstacles and driving forces for large customer organizations to buy light as a service.

There are different business models providing light as a service. The concept examined in this article builds upon a subscription to lighting [2]. Instead of buying lighting fixtures, the customer subscribes to a service of always having the "right light", given a monthly fee. The supplier retains ownership of the fixtures and cares for installation, maintenance, and adjustments throughout the contracted time.

Product service systems like the above are often put forward as an effective instrument for a more resource-efficient and circular economy, but in practice, their environmental effects may differ substantially and need to be assessed for each specific case [3]. A case study between a traditional supply of lighting and functional sales of light has been done by Jacobson et al [4] showing that the studied light as a service concept had about half the environmental impact compared to the traditional solution. The life cycle cost calculation, on the other hand, was in favour of the traditional business model, although the authors point out that this comparison did not include all costs, e.g. costs for adaptations or loan costs that may arise in the traditional alternative. In addition, "secondary cost savings" of the functional sales, such as improved job performance and reduced absenteeism, were also not included.

1.1 Understanding stakeholder perceptions of obstacles and drivers

This paper presents results from a study that aims to increase understanding between suppliers and customers of what drives and prevents a system shift in how light is procured from a linear to a circular practice - through the sales and procurement of light as a service. The entire project runs from August 2020 to May 2022. This paper reports on results from the first part of the project, which consisted of a cross-stakeholder interview study to identify and explore current understandings and concerns regarding light as a service among a broad range of stakeholders. The work focuses on indoor lighting in public or private spaces, such as schools and offices, with the customers being municipal or private real estate companies. The first part of the study is aimed at collecting examples of perceived obstacles and driving forces for light as a service among the broad range of stakeholders and to initiate cross-actor dialogue in the sector on how to overcome potential barriers to change.

2 Methods and data

The research has had a grounded approach, aiming at building theory from data through stakeholder interviews and interactions. Initial respondents were identified through brainstorming in the project team (consisting of researchers in life cycle management and circular economy and a supplier of light as a service). Further respondents were added through snowball sampling, where initial respondents recommended additional interviewees. The final sample was selected by the researchers to have a balanced representation of actors in different categories in the business ecosystem (no. of responders in parentheses):

- Suppliers (7) – Lighting suppliers (small, medium, and large), wholesales, construction companies
- Supporting actors (8) – Architects, light designers, governmental agencies, trade associations
- Customers (5) – Regions, municipalities, private estate companies

The response rate was very high, all respondents asked were willing to contribute to the study, indicating a high interest in the topic. Only a minor share of the respondents had personal experience in actual implementation or use of light as a service. In all, 20 interviews

were made (through telephone or web meetings). Each interview lasted about 1 hour and was documented through notes taken by the researcher during the interview.

Interviews were semi-structured. After a short introduction to the project given by the researcher, a conversation followed that evolved around:

- the general role of the respondent and the organization
- partners, roles, and business models in supply and demand of light
- experience and perceptions of circular economy, circular business models, and circular procurement
- advice on additional stakeholders or initiatives to explore

Results from the interview studies were further discussed in a stakeholder workshop to which respondents and additional stakeholders were invited. The overall purpose of the workshop was to validate the results and jointly discuss obstacles and opportunities with light as a service across stakeholder groups. The workshop was digital, lasted for 3 h and was attended by 20 people.

In a subsequent analysis of the results, interview transcripts were revisited to analyze what constituted potential common barriers and driving forces to light as a service in each identified category. The researchers also compared subjects and rationales between stakeholders being advocators with those being more neutral to the suggested business model.

3 Results and analysis

In semi-structured interviews, respondents talked freely about their experience, associations, hopes, and concerns regarding a circular economy and light as a service. In the analysis, the researchers identified reoccurring themes in responses, and based on these reoccurring themes from the empirical material, five categories could be identified that together covered the majority of aspects brought up by respondents; environmental impact, economic consequences, social aspects, competence, and, roles and responsibilities. See Table 1 for a list of categories and examples of aspects in each category.

A “heat map” was made to see if the three groups of stakeholders spontaneously emphasized different categories in their responses. Generally, responses were quite similar across stakeholders and most respondents commented in all categories. (Reduced) environmental impact and (lack of) competence (particularly among customers in regard to purchasing a function and technical issues around lightning) were emphasized by all stakeholder groups. Social aspects, such as work environment and impact on health and learning, were mainly put forward among the customer representatives. However, this kind of conclusion comparing results between the stakeholder groups should be made with caution, as the sample size was small and the setup was not designed for quantitative comparisons.

In the workshop following the interview studies, stakeholders were discussing the heat map and what may pose barriers to further market share for functional sales of light. They were also able to add new barriers or driving forces not yet identified from interviews.

Table 1. Categories of stakeholder associations and concerns as regards light as a service.

Category	Examples of aspects brought up by respondents
Environmental impact	Potential environmental benefits. Linkages to environmental and circular goals.
Economic consequences	How to economically compare the different business model How to include other values than financial in the assessment Potential depreciation effects when lighting fixtures are owned by a third party
Social aspects	The role of light for work ergonomics, wellbeing among users and effects on learning and productivity How premises for use and user adapted lighting may change with different business models
Competence	Uncertainties in how to procure a function Uncertainties in legal issues in public procurement laws Risk of customers not having enough technical knowledge to place the right demands and follow up on them Lack of competence in economic assessments in a life cycle perspective
Roles and responsibilities	Uncertainties in legal and technical responsibilities and liability Complexity of actors involved (e.g. lighting designers, architects, building contractors, and electricians in addition to lighting companies). The need for trust between supplier and customer Concerns about the change of suppliers and contracting timelines

3.1 Barriers and driving forces

After the workshop, the interview transcripts were revisited by the researchers to analyze what constituted barriers and driving forces to light as a service in each identified category. The researchers also searched for differences in rationales between stakeholders being advocators of the concept and those being more neutral to the suggested business model.

3.1.1 Environmental impact

A reduced environmental impact seems to be the main rationale for stakeholders to be interested in light as a service. Light as a service was generally perceived as beneficial from an environmental point of view (e.g. resources and climate).

3.1.2 Economic consequences

Respondents expressed both interest in, and uncertainties about, the economic consequences of light as a service. A reoccurring concern was how to make a fair comparison of the costs between a traditional supply of light and a functional sales business model. Respondents identified both direct and indirect economic effects as important to better understand and assess. Examples of the latter included how to assess other values than financial in the economic valuation, and potential depreciation effects when lighting fixtures are owned by a third party.

3.1.3 Social aspects

Social aspects were not the main topic for all respondents, but for some stakeholders, notably mainly those being the main advocators for light as a service, this was a major issue. The function-based business model allows for a more active adjustment of lighting depending on the uses and users of the building. In doing so, proponents see potential in improving work ergonomics, health, productivity, and wellbeing. Some respondents emphasizing these qualities could also provide concrete examples of social and health effects of users after the introduction of light as a service.

3.1.4 Competence

Both interviews and the workshop indicated widespread knowledge gaps concerning the concept of light as a service, with questions from how to assess and follow up on economic and social effects to technical and legal issues of installation and maintenance. Customers were particularly seen as a stakeholder group in need of increased competence, e.g., in how to procure a function, how to formulate demands, and how to follow up on economic effects. At the same time, questions were also raised on what is reasonable to demand from the customers/purchasing organization in regard to its ability and responsibility in increasing its competence in such a technically complex area as lighting.

3.1.5 Roles and responsibilities

Lighting includes many different actors in its design and installation, from light designers and architects to lighting fixture producers, distributors, electricians, and facility managers. A shift in business model stirs established business relationships and induces uncertainties in legal and technical roles and responsibilities. The stakeholders also expressed concerns that functional sales would provide lock-in effects and make a change in supplier more difficult.

The supply and demand of light include a complex actor structure that produces both soft and hard values. To this end, an all-inclusive solution through functional sales could make it easier for the customers, who then "only" need to express the performance wanted. However, knowledge, tools, and experience in formulating needs and assessing effects (environmental, economic, and social) are lacking. To end the stalemate, customers probably need to trust the supplier in providing the function asked for, until a larger number of reference cases exist. In parallel, there is a need for developing knowledge, experience, and tools for follow-up on service provided.

3.2 Value proposition revisited

The category "social aspects" draw the researchers' attention as some respondents (notably those being advocators of light as a service) put a lot of emphasis on this particular field, while it was not mentioned at all by others. Typically, stakeholders with their own experience and/or focus on the users (e.g. customer representatives), saw benefits such as better work ergonomics and increased health among users due to increased possibilities of adaptation of lighting. Thus, their perception of the value proposition seemed to be a shift from "lighting fixtures" to "always the right light". In contrast, those perceiving light as a service being merely a shift from buying "lighting fixtures" to buying "lighting" struggled with question marks on practical and economic issues and did not see clear overall benefits with the new concept.

The sample for the observation above is small and needs further research to be verified. Yet, a hypothesis from the study is that the (perceived) system boundaries of the value

proposition impact the business case: stakeholders that included social effects in the value proposition were more likely to be positive about light as a service. This result is in line with the research of Kristensen and Remmen [5], who emphasize the potential for social value creation when the focus shifts from product to service.

4 Concluding remarks

This study has indicated that the main driving forces for light as a service lie in the business models' potential impact on environmental and social sustainability, while barriers include uncertain economic benefits, lack of competence, and complexity in roles and responsibilities. The analysis points to the importance of increasing knowledge, reducing uncertainties, and creating trust between actors in the business ecosystem to decrease barriers to change. It also seems like extending the value proposition and increasing emphasis on the end-users and their social and health benefits are key for light as a service to become competitive with traditional business models.

This study is based on a limited number of respondents and results should be seen as hypotheses for further research, rather than conclusions for the sector at large. Nevertheless, interviewees and workshop participants represent a wide range of stakeholders. Results may well be valid as guidance on where knowledge gaps may exist and where to start intervening if the aim is to lower barriers to further implementation of light as a service as a business model for increased circularity.

Avenues for future research include studies of actual decision-making situations to further understand de facto obstacles and drivers; analysis of how obstacles and drivers may vary with different actors in the life cycle; and further exploration of the end-user perspective and its potential to increase value and decrease reluctance to circular business models in lighting.

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