

THE OTHER SIDE OF SUSTAINABLE INNOVATION: IS THERE A DEMAND FOR INNOVATIVE SERVICES?

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Abstract

As one prominent form of sustainable innovation, eco-efficient services have been promoted as a promising way towards more sustainable societies, but they have not turned into reality as expected. This paper argues that one of the primary reasons for the slow market penetration of eco-efficient services is the mismatch between customers' needs and service providers' offerings. While previous research has predominantly focused upon a variety of aspects of existing or potential eco-efficient service concepts, there is hardly any systematic research on customer needs for innovative eco-efficient services. In order to start bridging the knowledge gap, we investigate such customer needs through the analysis of interview and survey data obtained from over 300 potential customer companies in Finland, most of which operate either in the EU or globally. The paper discusses what kinds of eco-efficient services customers need and on what conditions, and which barriers hinder the use of eco-efficient services by business customers. Finally, we suggest modifications in sustainable service innovations in order to circumvent the present barriers.

Keywords

Sustainable innovations, customer needs, material efficiency, result-oriented services

1. Introduction

One of the important solutions directing western society towards more sustainable path is thought to be increased use of services, and especially eco-efficient services (Bartolomeo et al. 2003). Services are thought to reduce the use of natural resources and to provide substitutes for hazardous materials (Stahel 2000).

As a type of sustainable innovation, we examine innovative eco-efficient services and analyze the factors that affect on their acceptance and development in the market. Eco-efficient services can be divided into two broad categories, namely energy and material efficiency services. Out of these two, material efficiency services are less studied and thus they are the focus of this paper. With regard to material efficiency services we refer to a concept whereby the company minimizes its use of materials by purchasing services from a service supplier outside the firm. These purchased services aim to minimize or substantially reduce the use of materials in production, trade, and consumption cycles. Therefore they result in sustainability innovations (Halme et. al 2007).

Eco-efficient services can be grouped into product-based, use-oriented, and result-oriented categories, of which, according to (Tukker and Tischner 2006) result-oriented services are considered to have most probably the highest eco-efficiency potential. Result-oriented services aim to solve customer's specified and on-going needs more eco-efficiently than product-based or use-oriented services (Bartolomeo et. al 2003; Heiskanen and Jalas 2003). Where product-based services are extensions of product ownership with supporting services that require regular maintenance (for instance industrial cleaning equipment or supporting infrastructure such as ICT networks) (Bartolomeo et. al 2003), use-oriented services can include rental and leasing or repair, maintenance, and take-back services (Bartolomeo et. al 2003; Heiskanen and Jalas, 2003).

With regard to business-to-business sustainable service innovations, prominent examples are found within the field of chemicals, where services that aim to produce material efficiency gains throughout the chemical supply chain (Jakl and Schwager 2008, Mont et. al 2006, Saling et. al 2002) have emerged. These solutions are used in several industry sectors, such as automotive and automotive suppliers, semiconductors and electronics, manufacturing, and food and beverages (CSP 2009). The ideas have also been introduced to waste management services as resource management or environmental services concepts (USEPA 2002; Ligon and Votta 2001; Ligon, Mishra and Votta 2000). These models have been under examination for example in EU funded research projects (Kortman et. al 2007),

or within the OECD (2004). Additionally, there exist market analyses from the United States (CSP 2009 and 2004).

Despite the abundance of sustainable innovation ideas during the past decade and a half, only a few radically sustainable service innovations have made their way to the mass market. Previous research suggests some explanations for this inconsistency.

Firstly, Hörte and Halila (2008) argue that in Sweden eco-innovations are targeted more at consumers than industrial customers. Moreover, innovators have difficulties to get funding and their business networks are smaller compared to other innovator organizations. These tendencies can have adverse effects on market penetration and acceptability, whether the innovation is technology or service. Secondly, related to the chemical management services briefly mentioned above, Kortman et al. (2007) and White et al. (1999) point out that customer organizations are afraid that they might lose control of their manufacturing processes or process competences to the service provider if they use excessive outsourcing. Additionally, service providers may not realize promised benefits or competitive pricing for the customer due to perceived lack of competition. Thirdly, there is a possible mismatch between the needs of customers and the provision of services offered by service providers. Furthermore, Halme et al. (2007) argue that result-oriented services are still an unconventional form of business and thus not readily accepted by potential customers. Nevertheless, until greater adoption of sustainable innovations occurs, multiple instances for reducing resource consumption and safeguarding biodiversity will remain as nothing but unattainable ideals. A further reason for this development is a possible mismatch between the needs of customers and the provision of services offered by service providers. Furthermore, Halme and her colleagues (2007) argue that result-oriented services are still an unconventional form of business and thus not readily accepted by potential customers. Nevertheless, until greater adoption of sustainable innovations occurs, multiple instances for reducing resource consumption and safeguarding biodiversity will remain as nothing but unattainable ideals.

Given the above, it is surprising how little the actual sustainable innovations demand has been studied. This paper seeks to start to fill this gap by examining customer demand in one area of sustainable innovation. Moreover, the focus is on result-oriented business-to-business material efficiency services that aim at reduced use of materials in industrial and commercial processes. The following research questions guide the study: (1) What material efficiency related needs and barriers do customers have; (2) What kinds of material efficiency solutions do customers expect from service providers; and (3) What are the

differences between groups of customers, e.g. depending on the industry and the level and the organizational status?

By focusing on customers' perceptions and needs, it is possible to assess the basis for advanced result-oriented services for material efficiency and these services relationship with existing services, such as waste management, and environmental or supply-chain management services. This focus on customer demand makes it possible to explore the basis for result-oriented material efficiency service innovations. Furthermore, these new sustainable service innovations might be related to existing services, such as waste management, environmental or supply-chain management services.

The paper proceeds as follows. We first report an extensive literature survey. Thereafter, we examine systematically, firstly, how material efficiency is understood among potential customer companies in different sectors including industrial manufacturing, retail and wholesale, construction and transportation, and logistics services, and secondly, what kind of needs and barriers for services exist in these sectors. The data for this study was gathered from 2008 to 2010 in two research projects. The dataset consists of 30 analyzed interviews, two analyzed focus groups, as well as a survey in over 300 largest companies in Finland. Finally, drawing upon the analysis, we map possible material efficiency solutions for service providers.

2. Literature review

In order to obtain a representative picture of the extant research on customer needs, eco-efficient, result-oriented and innovative services we conducted a literature review. The selection of potential articles was carried by performing a search with the following search terms: eco OR eco- OR eco-effi* OR eco-inno* AND service* AND customer* AND need* OR demand. The Scopus database was examined; this is one of the major online databases of published papers from several subject areas and disciplines. The search was limited to peer-reviewed journals and explored the abstract and keyword fields only. The first selection produced 249 articles. After this selection, the article abstracts were reviewed according to subject area categorized in Scopus (Business, Management and Accounting, Economics, Social sciences and Environmental Sciences). Thereafter, all the articles without connection to innovative eco-efficient services, eco-efficiency or environmental issues or sustainability and to customer needs were excluded, which resulted in a list of 108 articles. Within this 108 the customer perspective of material efficiency services and the result-oriented view, was rarely analyzed, even though satisfying the customer needs lies at the heart of every successful business. Rather than customer needs, previous research has focused on other

issues related to eco-efficiency. Namely, sustainable production-consumption systems [19] and sustainable product-service systems from both the theoretical and case study perspectives (for described studies see for example Tukker 2004 or Bartolomeo et al. 2003, with connection to systems innovations (Williams 2007), and social capital and sustainable consumption (Briceno and Stagl 2006). Some articles focused on different industries from the eco-efficiency perspective, and analyzing the potential sources and ways in which eco-efficiencies could be obtained (Van Caneghem et al. 2010; Van Berkel 2007).

After this, the remaining articles were selected in a sequential procedure, resulting in a list of 41 articles published between 2003 and 2010 that focus, in a broad sense, on customers and needs. Appendix A presents details of the Journal and number of articles published in a given year. These 41 articles were grouped by the topics they addressed, with consideration to whether the focus was on business-to-business (B2B) or business-to-consumers (B2C) issues.

From these 41 articles only six dealt with customer needs and business-to-business (B2B) services to some extent; the main focus of this study. These B2B articles analyzed waste avoidance and commitment to sustainable procurement (Dawson and Probert 2007). Three articles discuss supply chain management, of which one concentrated on supplier responsibilities (Lai et al. 2008), the second on customer pressures in greening of supply-chains (Delmas and Montiel 2009), and the third on green supply-chain and purchasing (Eltayeb 2010). One of the articles deals with willingness to pay for environmental improvements (Leung 2005) and one focused on what other reasons than stringent regulation make companies adapt green practices (Paulraj 2009). Only one of the articles (Halme et. al. 2007) deals directly with innovative business-to-business material efficiency services and customers. The remainder deals with other issues, each of which have extensive research and literature of their own. The B2C articles deal with three themes; firstly with eco-tourism (e.g. Nepal 2007, Khan 2003), secondly with customer experience and satisfaction (e.g. Daub and Ergenzinger 2005), thirdly with consumer behavior and energy consumption and energy related consumer decisions (e.g. Faiers et al. 2007; Sammer and Wüstenhagen 2006). Again most of the articles discuss issues not related to innovative material efficiency services or sustainable innovation. Only one focuses on waste avoidance from households and product-service systems perspective (Gottberg et al 2010) and another article on sustainable household services (Halme et al. 2006). Appendix Two shows the topics and the number of articles that deal with the particular topic. The same appendix also presents an indication of whether the topics are related to B2B or B2C services.

3. Data and research methods

This research combines both qualitative and quantitative data and methodology. The qualitative part of the research consists of 30 interviews, 2 focus groups, and their analysis. The quantitative part consists of survey of 294 respondents. The aim of combined methodologies is to gain as versatile picture of the phenomena as possible and to be able to perform a thorough analysis of materials efficiency issues and their solutions in the companies studied. The data for this research was mainly obtained during spring and autumn 2008. For the analysis, we used PASW 18 statistical software for the quantitative data, and NVivo 8 software for qualitative data. The research design is illustrated in Figure 2.

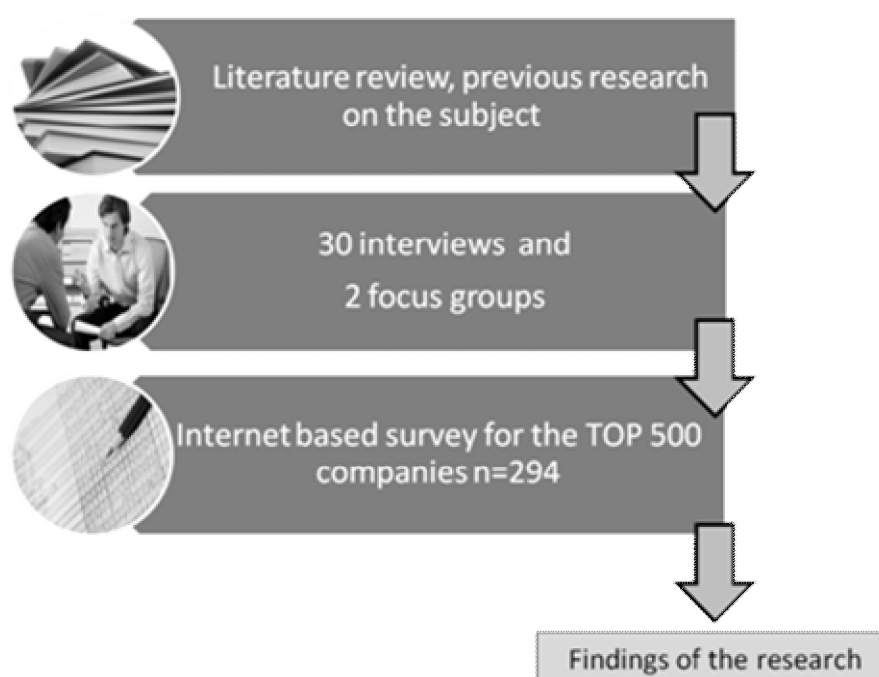


Figure 1. The research design

The respondents to both survey and the interviewees correspond to the companies with considerable and variable materials usage and are thus potential customers for material efficiency services. The criterion for selecting the companies for interviews and survey was that they cover the most interesting industries regarding material efficiency in Finland. The sectors studied in this research are manufacturing industry, wholesale and retail trade, logistics and forwarding, and construction. These sectors present approximately 64 percent of the industrial waste generated in Finland (Statistics Finland 2009), highlighting the need for increased material efficiency. In addition, all the companies included in the data are

among the 500 largest in Finland measured by their turnover and number of personnel. A large number of the participant companies operate at either a European or global level. We analyzed the survey data (294 responses out of 1.675) using cross tabulations between responses for each of the core questions (for questions, please see for appendix D) using three different independent variables. The first variable concerns industry sector (manufacturing industry, wholesale and retail, logistics and forwarding together with construction), the second concerns professional occupation of the respondents, classified as general management, purchasing, and others. We combined the environment, health and safety (EHS), business development and real estate management respondents into one group, namely, others because they concentrate more on support of business operations, whereas business management and purchasing are more connected to inbound material usage. The third independent concerns the turnover of the company (less than 200 M€, 200-499 M€, 500-1000 M€, more than 1000 M€). Cross tabulations allowed the analysis of the joint distribution of two variables, in order to assess whether the variables are related to each other. We conducted significance testing for the cross tabulations based on the chi-square distribution, which is employed to test the null hypothesis that the two variables are independent of each other. We combined the sectors of logistics and forwarding with construction because of the small number of respondents. Most of the interviews preceded the survey. The distribution of the survey respondents is presented in the table below (Table 1).

Table 1. The distribution of interview and survey respondents by organizational level and professional status.

Organizational level of respondent	The interviewees (N=30)	The survey respondents (N=294)
Corporate	50 %	34 %
34 %Business Unit	30 %	40 %
Facility/Factory/Outlet/Construction site	20 %	26 %
Professional status		
General Management	20 %	42 %
Purchasing	7 %	15 %
Health, safety and environment (HSE)	60 %	18 %
Business development	3 %	18 %
Real estate management	10 %	7 %

Thematic interviews were carried out from June to November 2008. The interview themes and questions were determined by the literature review conducted during the research project. Although the themes for the interviews and survey were similar, we gave the interviewees some freedom to bring forth issues they considered relevant from their line of business or professional occupation. The interview responses were analyzed by grouping answers according to the research questions. This included customers' understanding of material efficiency, as well as their perceived material efficiency needs and barriers. Additionally, we considered views on outsourcing services to an external service provider. Two focus group interviews were organized as a means to discuss the research questions. The first group discussion focused on the wholesale and retail supply chain from an innovative material efficiency services perspective, and the second centered on the needs of technology industries, such as telecommunications service needs.

4. Findings

In this section we describe the findings from the survey and the interviews. Findings are grouped according to material efficiency needs and barriers. Prior to discussing needs and barriers, we first describe how informants understand material efficiency.

4.1 Customers' understanding of material efficiency

In interviews, manufacturing industry representatives understood the concept of material efficiency as the use of less material for the same production in a cost efficient way. Thus, they seem to have a relatively good understanding of the notion of material efficiency. For wholesale and retail, logistics and forwarding, and construction material efficiency was perceived in connection to the re-use and recycling of materials as a way to diminish and avoid waste. Additionally, this post process view of industrial sidestreams and their management is present in the manufacturing industry interviews.

To a certain extent, in the manufacturing industry, construction and logistics sectors sidestreams – including wastewater, sludge or ashes – are unavoidable. Thus, it would already be a significant improvement in material efficiency if these sidestreams could be managed and resources could be extracted back to the production processes. However, the representatives of construction companies perceived that development of more material efficient construction materials is outside their scope. They consider it to be more the business for the construction materials industry than for construction companies.

Willingness to outsource non-core businesses is a central concept related to the use of material efficiency and possible B2B services. If potential customers are not willing to use

outside service providers and would rather develop their internal competences in order to increase operations' material efficiency, there is no feasible future for innovative material efficiency services.

For manufacturing industry representatives, the distinction between core business and other support processes is clear. According to these informants, used materials and manufacturing technology are part of the core business and they are neither acceptable nor easy to outsource to external service providers. Especially recycling and the reuse of industrial sidestreams (including ash and sludge) require development. These types of waste streams are not part of the core business and yet they form large batches for landfill disposal and material for reuse. The management of these streams could be outsourced for capable service provider.

We identified the same distinction of core and support processes in the wholesale and retail sector, where sourcing and purchasing are considered as core business processes. Interestingly, these informants did not see how core business processes could be outsourced to a service provider, since they are the cornerstones of competitive advantage. One reason for these views is the fact that wholesale and retail companies use other tools, such as ISO14001 or BSCI standards, to evaluate and manage suppliers' environmental and social performance. Therefore, it may be that there is no reason to purchase an overlapping service.

The survey shows a statistically significant relationship, both in manufacturing industry and wholesale and retail business, between the respondents understanding of material efficiency problems and potential solutions, as well as their willingness to outsource solutions for a service provider. For example when observing willingness to outsource sidestreams material efficiency development solutions, over 60 percent of all survey respondents were willing to outsource when they considered having sufficient knowledge of the subject. In contrast, only 28 percent of respondents were willing to outsource if they perceived themselves as not having sufficient knowledge (Figure 2).

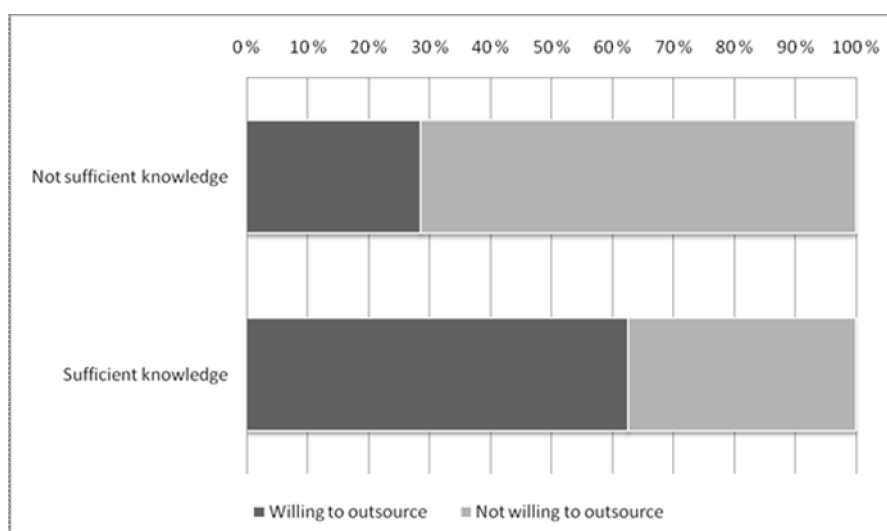


Figure 2. The relationship between willingness to outsource (the development of material efficiency for industrial sidestreams) and the level of knowledge of the issue at hand

The interviews illustrate that past experiences seems to have a great effect on the respondents' willingness to outsource material efficiency solutions to an external service provider. The informants were not willing to outsource if they had a strong view that service providers were not committed to solving material efficiency problems.

'My interpretation is ... the service providers do not see their primary goal to be waste avoidance or managing sidestreams for the customer ... and it is a kind of a questionable situation.' (Metals refining)

4.2 Customer needs for material efficiency services

The data analysis illustrates that material efficiency needs vary between industries and informant's professional position. However, similarities also exist. In the following section we highlight the main themes identified from the survey and the interviews.

4.2.1 Excess information, and yet not enough

With regard to the survey findings, all sector representatives seem to have sufficient and adequate information on material efficiency. However, statistically significant differences are discovered with respect to "Does your company have enough information of these fields? Planning store, warehouse, construction site, or place of business to minimize waste". Here, wholesale and retail are more likely to agree that they have sufficient information, whereas

logistics and forwarding with construction industry representatives are less likely to agree that they have sufficient knowledge. Additionally, with regard to the “knowledge on development of reusing, recycling of sidestreams” question, similar statistically significant differences are detected, with wholesale and retail being more likely to comply that they have sufficient information and logistics and forwarding together with construction being less likely to agree that they have enough information. The respondents working in the manufacturing industry perceived that they have sufficient knowledge of all material efficiency issues related to their production processes.

Compared to the survey, the interviews provide somewhat less assuring findings on knowledge level. Regardless of sector, there are different needs concerning information on material streams, whether they are sidestreams or industrial residuals, designing commercial outlets, or efficient use, re-use, and recycling of waste generated. Judging from the interviews, the overarching factor is a simultaneous excess and lack of information. This results from customers and current service providers producing data in large quantities on waste and materials usage. However, this information is not useful to improving material efficiency, because it does not contain enough location or substance specific information. For instance, one informant in mechanical engineering felt they have inadequate information on the compilation of purchased materials and compounds:

‘Some of the components and materials we use, we don’t know exactly what they are made off and whether they are REACH compliant or not.’ (Mechanical engineering)

The needs for this type of knowledge are derived from legislation, such as the EU chemicals regulation act REACH, as well as from product design and recycle processes. The more suitable the knowledge, the more it simplifies the product development and design processes resulting in better recycle rates with higher environmental and occupational safety. For the wholesale and retail sector, information material efficiency needs to be connected to knowing aggregate waste streams from shop or outlet to company level. Table four summarizes the information needs according to studied sectors.

In general, for those wholesale and retail or logistics companies dealing with B2C customers or their customers operating in consumer business, corporate responsibility and its communication through reporting is considered to be a key issue. The information needs are closely related to the ability to gain knowledge used in communication and reporting:

‘And we are buying all over the world ... I mean, how you can control that suppliers would operate in a responsible manner, that’s a workload I say.’ (Mechanical engineering)

In almost every studied sector, the changes in legislation related to material and energy efficiency and the demands that these changes impose on companies, are perceived as an important part of more advanced services yet to be developed. One informant concludes that their service provider should market their existing knowledge and competences to a greater degree:

‘This expert knowledge ... following the waste legislation, local environmental directive ... if somebody can know these things, it is this waste management company – they know these things. We know our business. In the last meeting with them I asked, why you don’t sell your service to others too.’ (Mechanical engineering)

In interviews, training employees is mentioned under many circumstances. Although many companies take care of their training internally, additional outside resources are used every so often. It is especially in waste management and recycling processes that an outside service provider usually provides the training.

Table 2. Customer needs: Information needs related to material efficiency by industry sector

Organizational level	Sector			
	Manufacturing industry	Wholesale/Retail	Construction	Logistics
Outlet/ facility/ construction site	• Information on components, materials, re-usability, recyclability, etc. • Information on changes in legislation, , how to improve and assure compliance • Training the staff	• Information on waste streams, quantities and qualities in appropriate details – useful for waste avoidance • Outlet planning for efficient waste avoidance and management, including recycling • Training the staff	• Information on waste streams, quantities and qualities in appropriate details – useful for waste avoidance • Information on legislation, changes to it, how to improve and assure compliance • Training	• Training
Corporate/ Business unit	• Information on technical innovations, on materials, recycling and technology • Aggregate Information on components, materials, re-usability, recyclability, etc. • Knowledge about supply chain management and corporate responsibility, including material efficiency • Information on legislation, changes to it, how to improve and assure compliance	• Aggregate information on waste streams, quantities and qualities • Comprehensive services • Aggregate facilities planning for efficient waste avoidance and management, including recycling • Energy and material (eco-) efficiency planning and management • Knowledge about supply chain management and corporate responsibility, including material efficiency – responsibility communication and reporting. • Training the managers	• Information on technical innovations, on materials, recycling and technology • Information on legislation, changes to it, how to improve and assure compliance	• Product/package planning (air travelling/ freight) with waste avoidance in mind. • Knowledge about available environmental and eco-efficiency improvements to air freight and travelling

Although companies generate large volumes of data related to material efficiency, there seems to be a need for an expert service to interpret it. According to the findings, some solution may lie outside the company, and an external service provider is called in.

4.2.2 Process innovation for sidestreams

For the heavy manufacturing industry, the management (re-use, recycling, avoidance, resource retake) of wastewater and sludge are crucial unsolved material efficiency issues that demand innovation.

‘Technically it is easy to extract the valuable metals out of waste – that’s no problem. The problem is to find a cost-efficient way to do it. So, there we need more innovation.’ (Metals refining)

As stated above, although these streams are not part of the core business, they form a substantial amount of material with the potential to reclaim it into the company’s own manufacturing processes. Moreover, there is the potential to direct these sidestreams to another company in the same or similar type of industries, who is able and willing to utilize it. However, the informants point out that in these types of advanced result-oriented services and business partnerships, the service provider needs to understand customer’s processes and cost structures in order to be able to promote material efficiency innovations and technical solutions. Thus, solving customer’s needs along these lines creates cost savings for the customer.

‘They should be able to truly connect [environmental issues, material efficiency] innovations with our cost structures and think how they could bring in solutions that truly save some money for us.’ (Wholesale)

Informants conclude that building shared knowledge and competences require time, work, and commitment from both parties. It demands trust between the customer and the service provider, which also takes time. One of the industry representatives points out that they have had this type of complex service contract with one service provider for almost seven years and it has only worked well during the last two years.

In the survey, all occupational groups considered that they have adequate information on all material efficiency issues related to the production process. However, statistically significant differences were found with regard to the “Planning logistics and supply-chain management for increased material efficiency”, with companies with a turnover of 500-1000 M€ being significantly more likely to answer that they do not have adequate knowledge of the planning of the logistics and material efficiency. In contrast, respondents from companies with a turnover of over 1000 M€ were more likely to agree that they had sufficient information on material efficiency.

One reason for this finding might be that medium size companies (500-1000 M€ turnover) have enough understanding to recognize material efficiency needs and opportunities. Yet, they find it hard to designate personnel and other resources for finding information and gaining competences for developing the material efficiency of their logistics and supply chain management. On the other hand, the largest companies (> 1000 M€) may already have sufficient available resources.

Similarly, interviews revealed that, for example, in wholesale and retail business, the planning of outlets, markets, and warehouses from the perspective of waste avoidance, reuse, and recycling, is a focal issue in logistics management.

‘The challenge for our business is those numerous small categories of waste ... as an example metals. The batch size is so small ... how can we better utilize (re-use, recycle) it?’(Wholesale)

4.2.3 Turnkey services

According to the interview data, there is a need for comprehensive turnkey services. Informants understand that this services refers to one service provider producing the whole set of material efficiency services, including solutions for waste avoidance (or “achieving the zero waste goal” as stated by one of industry respondents) to more traditional waste hauling and industrial cleaning services. The turnkey service is preferably a service package that is transferable to all production facilities.

‘... who [service provider] is able to service us also outside Finland and able to offer turnkey services and solutions in a way that we don’t have to be negotiating contracts with four different parties.’ (Mechanical engineering)

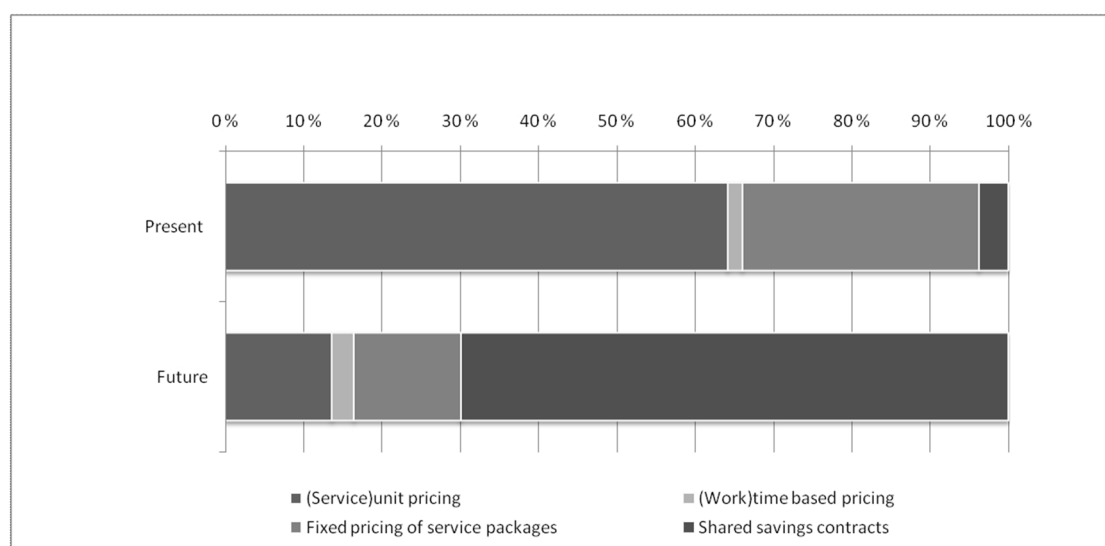
Fifty-four percent of the survey respondents agree with the question: “It would be beneficial to my company, if we could purchase all services from a single service provider”. At same time, manufacturing industry interviewees do not want to be dependent on one service provider, fearing the lack of competitive pricing and being overly dependent on one service provider. For the wholesale and retail sector, the desire for turnkey services crops up when discussing the planning of warehouses or retail outlets. Additionally, they emphasise that it could increase the use of turnkey services if the service providers offer solutions both for material and energy efficiency (for example refrigeration throughout the supply-chain) and climate change challenges (for example CO2 footprint calculation). In wholesale and retail, energy efficiency and reducing energy consumption is considered to be as important as material efficiency.

4.2.4 From costs to shared savings

In interviews, informants discuss varying motives for material efficiency. Some of these motives relate to expectations either from a company's customers, employees, or management. However, the majority of the motives for engaging in material efficiency relate to expected operating savings. Across the sectors and professional status, they conclude that in-business savings and increased revenues are the name of the game.

Furthermore, potential customers of innovative result-oriented services desire alternative pricing mechanisms that are different from the present situation, where the emphasis is on reduced environmental impacts through saved resources. For environmental and waste management services (Figure 3), perceived pricing is currently mainly based on service unit pricing (hauling fixed amount of solid waste or recyclable waste), whereas in the future customers expect pricing based on shared savings contracts for advanced services. In these anticipated agreements, waste reduction or material efficiency and cost savings targets are defined explicitly, and the savings or profits are divided between the customer and the service provider accordingly.

Figure 3. The respondents' views on present pricing and desired pricing of advanced environmental and waste management services



These advanced shared profits or savings contracts need to be clear enough, and they need to include a risk management assessment, profit logics, and shared understanding of the issues mentioned above.

'[o]ffers them in a way that each [service] has its own business case and offers them with risk management and define the way in which profits are made, and they all would be clear.' (Telecommunication and electronics)

At the same time, with the need for contracts with shared savings, there is a fear of unclear responsibilities. More complex contracts include the potential for complex settlements in case of incidents, because the party responsible for costs needs to be identified. The difficulty associated with unclear responsibilities is perceived to be a barrier to the use of material efficiency services by almost 40 percent of the industry respondents. From the consumer goods industry perspective, clear responsibilities between the service provider and the customer are crucial due to potential market withdrawal or brand losses.

4.3 Barriers to purchasing and using material efficiency services

Even though there are clear needs for advanced result-oriented services relating to material efficiency and broader eco-efficiency, there are also barriers to engaging in these activities. Therefore, it is critical to know how sector, company, or facility level issues work as barriers together with broader social, economic, and legislative issues affecting the development and use of these services.

These barriers were identified in the interviews and examined in the survey. The distribution of responses to barriers question is presented in Figure 4. The logistics and forwarding sector was combined with construction due to the small number of respondents.

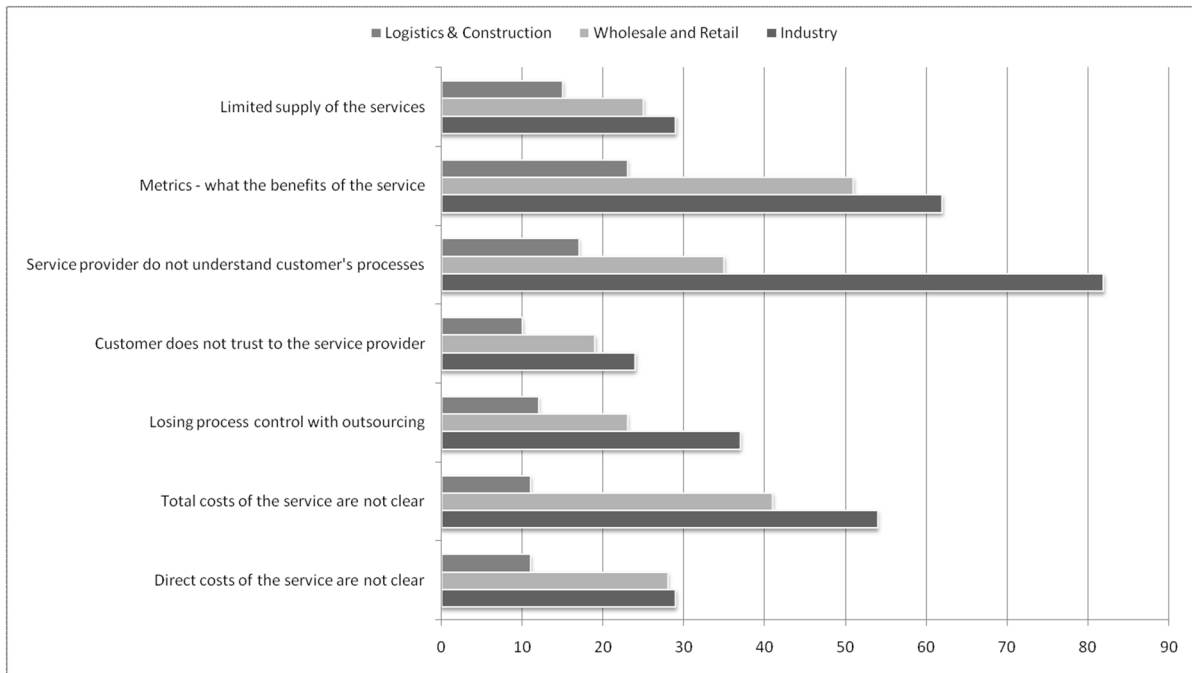


Figure 4. The distribution of the survey answers relating to the barriers for using outsourced material efficiency services

In addition to the survey responses, some further barriers are mentioned in the interviews. After describing below the barriers identified in the survey and supported by the interview findings, we discuss the further barriers identified from the interviews.

As previously mentioned, the willingness to outsource or purchase services is greatly affected by previous experiences of outsourcing, in addition to knowledge of material efficiency. When practitioners have more information of these material efficiency and outsourcing, they are more willing to use services offered by outside service providers.

4.3.1 Service providers' unawareness of customers' processes and business

'My boss told me that there were these sales people ... they did not have a clue what our company was doing and they tried to offer something that didn't fit in our operations ...' (Paper and pulp industry)

Especially for manufacturing industry interviewees and the survey respondents, the highest barrier for discouraging the use of material efficiency services is distrust for the service providers' knowledge of customer's manufacturing processes. The respondents from the wholesale and retail sector share the same doubts concerning their core processes, namely purchasing and sourcing. The survey findings support this view, particularly with regard to manufacturing industry respondents. Altogether over eighty percent of the survey respondents consider it be unclear as to whether the service providers understand their

(potential customers for the material efficiency services) core processes. Thus, they question whether the service provider is able to create material efficiency improvements and other benefits.

The interviewees from the manufacturing industry are concerned about the outside service providers' capabilities to solve customer's material efficiency needs. Informants concluded that service and technology providers that already closely operate with their company could have sufficient competence to assist with material efficiencies in the core manufacturing processes. These types of services were already purchased from companies that had previously been business units or subsidiaries of the (customer) company.

Within the manufacturing industry, the reason for not trusting the service providers may be due to previous unsuccessful experiences using these types of advanced material efficiency and side stream management services. The respondents did not articulate the experiences in detail. They merely noted that the service providers "could not keep their promises" or their aim was still to create profits out of traditional waste hauling instead of waste avoidance or recycling.

For the manufacturing and metals refining industry representatives, trust is closely connected to liability issues: Who is responsible if something goes wrong with production process and there are severe impacts on human health and the environment? This view comes up in the manufacturing sector, such as in metals processing, and electronics industries. In their view, responsibilities and practices close to core processes are better if maintained within the (customer) organization and not outsourced.

4.3.2 Operationalising material efficiency in business – metrics for benefits and the costs

Another barrier identified from the interviews is the service providers' failure to produce clear and useful metrics that show the environmental and economic benefits of a particular service. It emerges from the interviews that service providers do not change or enhance the development of their offering based on customers' needs, but instead try to offer existing models.

'Environmental reporting? They had built their system of district/region based – according to their own needs, not the customers'. (Mechanical engineering)

Furthermore, the survey highlights the importance of metrics. For the wholesale and retail sector, the deficient delivery of metrics was the highest barrier with 50 percent of respondents recognizing this. This was also the case with the combined logistics and construction sectors (25 percent of the respondents). Additionally, two professional groups

considered the metrics as the largest barrier to purchasing advanced material efficiency services: Over 60 percent of general management and 23 percent of purchasing professionals perceived it to be highest barrier for using services.

The metrics are an issue closely related to the costs of the service (total cost of a service and the direct cost of services), which was found to be a considerable barrier. Interview respondents brought forward the idea that metrics had to show the relationship between costs, savings, and the environmental issues, and should present in an understandable way the deviations from desirable practices and outcomes.

Moreover, the findings from the interview analysis suggest that customer companies want an accurate connection between metrics and the service results closely related to their own cost-structures. All informants are aware that besides the environmental benefits, they have to be able to understand and present to their colleagues and supervisors the economic benefits occurring from innovative services. Interestingly, most of the interviewees were environment, health and safety professionals, who could discuss more environmentally driven issues, and yet their answers signal the need for cost savings and a business case for innovative material efficiency services. This discussion relates to the needs for new cost models previously mentioned.

4.3.3 The passive marketing of innovative and advanced services

Although there are companies that offer innovative material efficiency services in side stream management and waste avoidance, the findings from the survey show that respondents were unaware that these services exist. Especially within the manufacturing industry, the perceived lack of service supply was seen as a hurdle to using material efficiency services. Almost thirty percent of industry respondents and twenty-five percent of wholesale and retail respondents report it as a barrier. This finding is supported by a question measuring whether the respondents feel that service providers actively sell their services to them. The respondents considered that the service providers for material efficiency services had not actively contacted them nor marketed their services (Figure 5).

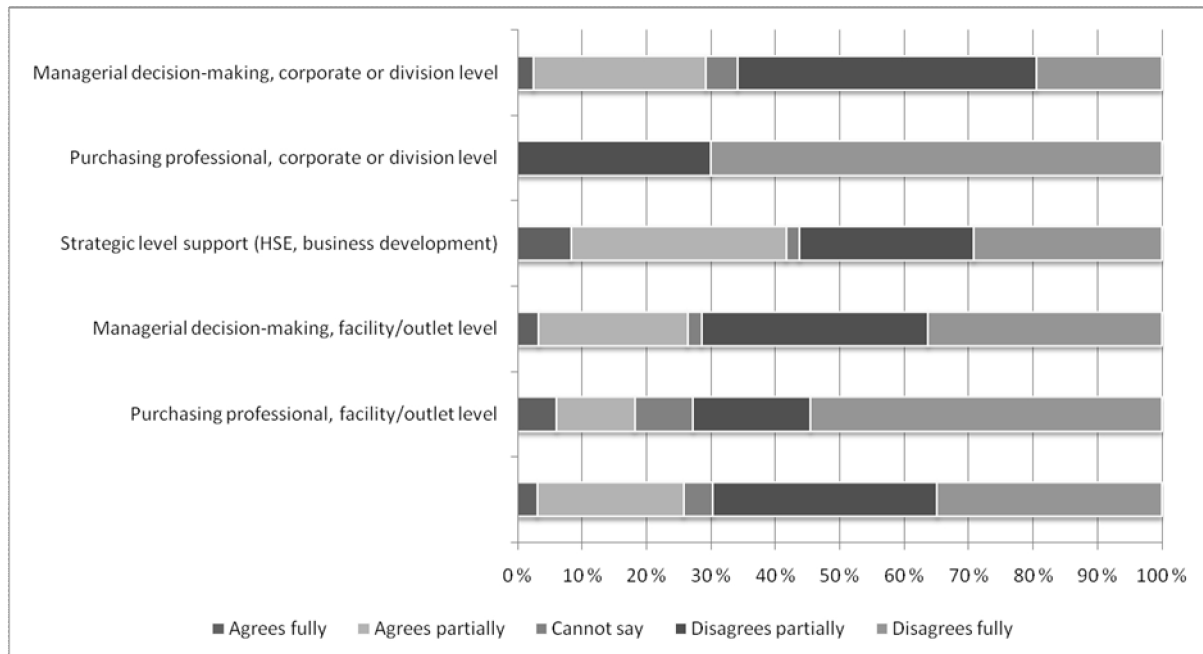


Figure 5. The distribution of answers to the question: 'Service providers of material efficiency services have actively contacted me or marketed their services'

The interviewees point out that a lack of national service providers is considered a threshold, which prevents the development and use of material efficiency services. In the wholesale and retail sector, the potential to offer countrywide services for the whole chain is central. At the time of the interviews the sector faced pressure to standardize processes throughout the chains, for example in hauling, recycling, and planning services. Additionally, a lack of national competition is perceived to be a threat, hindering the development of new services and raising the prices for existing services.

4.3.4 Other barriers for acquiring material efficiency services

Customers have no resources to start using material efficiency services. Another bottleneck for the wholesale and retail sector is the lack of budgetary and personnel resources to gain knowledge about the supply of advanced material efficiency services. When companies have resources to discover and understand result-orientation and material efficiency, they are more willing to use these services.

'It [outsourcing], it depends on the situation ... how much we have our own resources in use and available.' (Dairy products industry)

Previous research in the paper and pulp industries (Halme et al. 2007) supports these findings. However, in the present study the representatives of this industry did not bring this issue to the fore.

Material efficiency services are opposed within the customer organization. Although not clearly present in the survey findings, the interviewees raise the issue of opposition toward material efficiency in their representative organization. Wholesale and retail interviewees also understand the opposition within their organization hindering the use of outsourced services and development of material efficiency actions. A reason for this internal opposition seems partially to stem from the inability of EHS professionals to show the cost benefits of material efficiency and waste avoidance, in addition to environmental benefits. The interviews illustrate that in the companies the personnel have to be able to sell the material efficiency projects to decision-makers with cost-savings if they want to introduce new activities that go beyond legal and regulative compliance.

For using services the internal operations need to be reorganized. For the manufacturing industry as well as for wholesale and retail, the existing organizational structures were seen as a hindrance to outsourcing and using material efficiency services. With a complicated structure and many generations of employees, it is not easy to push material efficiency changes in operating logics.

Legislative requirements prevent changes. In interviews, representatives from manufacturing industry and wholesale and retail sector point out that sometimes the legislator does not harmonize bills from different government areas. For example wholesale and retail companies face intense requirements with regard to the safety of food. Therefore, practitioners face situations where they are not able to engage in material efficiency projects due to existing legislation.

5. Concluding discussion

Sustainable innovations have gained relatively little acceptance in markets despite abundance of research on sustainable or eco-innovation, innovators, environmental policies aimed at supporting them and service providers offering innovative services. Focusing on one area of sustainable innovation, result-oriented material-efficiency services, this paper examined customer perceptions of the material efficiency concept and its relationship with everyday business operations in key industry sectors, namely manufacturing industry, wholesale and retail, logistics and forwarding, and the construction industry. The paper also identified the material efficiency needs in these sectors and the perceived barriers and potential drivers for using innovative material efficiency services. These services aim to minimize or substantially reduce the use of materials by purchasing services from outside service providers.

The findings of this study illustrate that there is a need for result-oriented innovative material efficiency services in business-to-business field. However, there are mismatches between

the supply of innovative material efficiency services and customer needs. Firstly, Judging from the findings, material efficiency needs are very closely knitted to cost-efficiencies in the potential customer's business operations. This observation indicates that customers are cost-driven and they are not convinced that innovative material efficiency services can create savings together with environmental benefits and legal compliance for customers. For the future development of material efficiency services, it is clear the service providers need to be able to show clearly how their services bring about both economic and ecological benefits, which means they have to be able to construct and present a solid business case. This demands industry specific knowledge and customers' process understanding. The flipside of these needs is the perceived barriers for using services. Service providers have not been able to demonstrate the economic and environmental benefits and customers do not trust them to be able to provide these services.

Secondly, most of the potential customer needs related to a pressing shortage of adequate knowledge of the qualities and quantities of materials flows, and their optimal management throughout the lifecycle. In all of the sectors studied, this calls for better monitoring, data gathering and management, and analysis. In order to convince potential customers of the benefits of innovative material efficiency services and their market acceptance, it is clear that knowledge management, monitoring and reporting as part of or as a service needs to be developed. In the chemicals management service mentioned at the beginning of this paper, the utilization of ICT innovations have been one of the key elements for their success. Further studies are needed to uncover how material efficiency (material flows and their qualities) are connected the existing ICT systems used in companies, and what could be learned from chemicals management.

Thirdly, for manufacturing or refining sectors, process knowledge is demanding and something that is perceived not to exist outside the particular industry. Thus, material efficiency solutions are something that cannot be outsourced. However, industrial sidestream management and, for example, taking resources back into production processes, are something that needs innovation. Then again, purchasing is a core business for wholesale and retail, but innovation and services are needed in planning of logistics, facilities, and outlets. This leads to the conclusion that for service providers, specialization to one or a few closely related sectors is worth pursuing. From the research and service development point of view, different types of operating logics and combinations of technology and organization need to be studied and developed further.

Fourthly, although there are services and service providers at the markets, yet the findings indicate that marketing of these services is very passive. Potential customers do not know

about these types of services. One reason might be that service providers are cautious about marketing, because innovative services are still at the stage of new business development or they only offer to certain customers because of their complex nature, for example related to technology, reorganization of customer relationships, or need for skilful personnel. This tendency requires more research that directly focuses on these aspects.

Although environmental policies and legislation can be drivers for new result-oriented solutions such as material efficiency services, our findings suggest that they can also be a strong hindrance to the adaptation of innovative material efficiency services. For companies, policies and legislation sets the targets for their environmental actions, and thus also the incentives for material efficiency improvements. Simultaneously, existing legislation can be a hindrance to using services when it for example defines that certain technologies and processes are acceptable and others not, instead of setting material efficiency or other environmental targets. Narrowly defined technologies and processes do not leave space for invention or new business models.

The findings illustrate that the identified needs for material efficiency are quite pragmatic and related to side stream management and reuse, knowledge and data management and their costs, as well as potential savings. However, it seems that the step from pragmatic needs to radical industrial changes is a great one. Still, services solving these needs can create substantial material efficiency gains and open the door for more radical result-oriented services and other sustainable innovation.

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Appendices

Appendix A. The Journals, according to publishing year and the number of articles related to customer needs, services and environmental issues. The articles with more than one article are presented in order by descending number of articles, and the rest of the journals are presented in alphabetical order

Energy Policy	2008, 2007, 2006, 2005	4
Business Strategy and The Environment	2009, 2006, 2005	3
Journal of Sustainable Tourism	2007, 2004	2
Anatolia	2007	1
Annals of Tourism Research	2003	1
Building Services Engineering Research and Technology	2008	1
Corporate Communications	2006	1
Ecological Economics	2007	1
European Journal of Marketing	2005	1
European Review of Agricultural Economics	2005	1
Fibres and TEXTiles in Eastern Europe	2008	1
IET Intelligent Transport Systems	2008	1
Indoor and Built Environment	2005	1
International Journal of Ecodynamics	2006	1
International Journal of Environmental Technology and Management	2010	1
International Marketing review	2009	1
Journal of Business Ethics	2008	1
Journal of Economics and Management Strategy	2009	1
Journal of Hospitality and Leisure Marketing	2008	1
Journal of Manufacturing Technology Management	2010	1
Journal of Service Marketing	2010	1
Progress in Industrial Ecology	2006	1
Service Business	2007	1
Service Industries Journal	2008	1
Silva Fennica	2009	1
Sustainable Development	2007	1
Twist	2009	1
Total		41

Appendix B. The grouped themes of the articles, and whether the focus was on business-to-business or business-to-consumer services

Topics	Number of articles	B2C/ B2B
Eco-tourism, customer experience, customer satisfaction	7	B2C
Energy, Electricity, consumer behaviour and decision-making	4	B2C
Consumer behaviour attitudes, customers as drivers (food, textiles, car sharing, wine)	5	B2C
Value for customer, value-cost ratio, business models	3	B2B
Eco-labelling, effect on consumer behavior, etc.	3	B2C
International Standards (ISO 14001, etc.) effect on supplier behaviour, green purchasing	3	B2B
Supply chain management -supplier relationships,	3	B2B
Co-manufacturing, customer as co-developer, customer as env. Entrepreneur	2	-
Company motivation in decision making for environmental actions (eco-design)	2	B2B
Waste avoidance, households, PPS	2	B2C
Household services, LETS, sustainable services	2	B2C
Willingness to pay or invest for enviromental improvements	1	B2B
Socially responsible investments (individual consumers) motivation	1	B2C
Conceptual articles: conspicuous consumption, consumption as	2	B2C
Evaluation of Forest policies - forest owners attitudes, environmental issues	1	-
Total	41	

Appendix C. The survey questionnaire

1. Main sector a. Manufacturing industry b. Retail and wholesale c. Logistics and forwarding d. Other 2. Main operational level within the organisation a. Corporate b. Area of business c. Business unit d. Other 3. Professional identity a. General management b. Purchasing c. Environment, health and safety (EHS) d. Development e. Real estate management f. Other 4. Turnover (million euro) 5. How the following factors are noticed during the purchasing processes? Does your company have enough information of these fields?

- a. Environmental impacts
 - b. Health impacts
 - c. Possibility to decrease the amount of waste
 - d. Exploiting as energy
 - e. Exploiting as material
 - f. Planning the logistics bearing in mind material efficiency
6. Which companies offer you services related to the above mentioned fields?
- a. Consulting companies
 - b. Environmental care companies
 - c. Research organisations
 - d. Suppliers of used materials
 - e. Other
7. What is the significance of following actions in the purchasing process? Would you be ready to purchase these solutions from an outside service provider?
- a. To solve the environmental impacts of used material
 - b. To solve the health impacts of used material
 - c. To decrease the amount of waste by influencing the material streams
 - d. To plan the logistics bearing in mind material efficiency
 - e. To predict the reuse of energy from material streams
 - f. To predict the reuse of used material(s)
8. What is the current pricing mechanism for above mentioned services in your company? What the pricing mechanism should be in the future?
- a. Business unit based pricing
 - b. Hour based pricing
 - c. Fixed monthly or annual pricing
 - d. Sharing the cost-savings and benefits
 - e. Other
9. Which of the following areas are taken into consideration during manufacturing processes? Does your company have enough information of these fields?
- a. Improving material efficiency by planning production processes
 - b. Improving the use of support materials in production
 - c. Planning store, warehouse, construction site, or place of business to minimize waste
 - d. Planning logistics bearing in mind material efficiency
 - e. Developing the use of sidestreams from production/process
10. (Wholesale and retail only) Which of the following areas are taken into consideration during manufacturing processes? Does your company have enough information of these fields?
- a. Planning store, warehouse, construction site, or place of business to minimize waste
 - b. Planning logistics bearing in mind material efficiency
 - c. Developing the use and management of sidestreams created in processes
11. (Wholesale and retail only) In your opinion, how significant it is to take into account the following aspects during the use of materials or production? Would you be ready to purchase a solution from an outside service provider?
- a. Improving material efficiency by planning production processes
 - b. Improving the use of supportive materials in production
 - c. Planning store, warehouse, construction site, or place of business to minimize waste
 - d. Planning logistics bearing in mind material efficiency

- e. Developing the use of sidestreams from production/process
- 12. What is the current pricing mechanism for above mentioned services in your company?
What the pricing mechanism should be in the future?
 - a. Business unit based pricing
 - b. Hour based pricing
 - c. Fixed monthly or annual pricing
 - d. Sharing the cost-savings and benefits
 - e. Other
- 13. According to your estimate, on which organisational level decision-making related to material efficiency takes place?
- 14. According to your estimate, how is the decision-making divided among different organisational levels?
 - a. General management
 - b. Purchasing
 - c. Environment, health and safety (EHS)
 - d. Development
 - e. Real estate management
 - f. Other
- 15. Who should be involved more in decision-making?
- 16. What are the most significant barriers to purchasing material efficiency services?
 - a. Direct costs of the service
 - b. Total costs of the service are not clear
 - c. Losing control with outsourcing
 - d. Do not trust the service provider
 - e. Service provider does not understand customer's processes
 - f. Metrics – What are the benefits of the service?
 - g. Limited supply of services
 - h. Other
- 17. How are the following services carried out in your company (the division between internal and external work)? What is the need for development on each service?
 - a. Generating information for stakeholder communication
 - b. Generating information for authorities
 - c. Generating indicators and reports for internal comparison
 - d. Evaluating the level and quality of environmental care
- 18. How are the following services carried out in your company (the division between internal and external work)? What is the need for development on each service?
 - a. Waste management: Collecting, recycling and handling of waste
 - b. Industrial maintenance
 - c. Cleaning
 - d. Recycling guidance and training
 - e. Generating information of waste volumes and categories
- 19. What is the main pricing mechanism for above mentioned services in your company? What the pricing mechanism should be in the future?
 - a. Business unit based pricing
 - b. Hour based pricing
 - c. Fixed monthly or annual pricing
 - d. Sharing the cost-savings and benefits
 - e. Other
- 20. Please indicate your attitude toward the following statements:
 - a. Environmental care services are being actively sold to me.

- b. I am willing to discuss my needs and solution alternatives with a service provider.
- c. Before I am ready for cooperation, I want references related to measurable results from the service provider.
- d. I am often personally in contact with a service provider.
- e. It would benefit my company if all services could be purchased from one service provider.
- f. I have a positive attitude toward services, which have not been too developed into an offering.
- g. Partnerships create value for environmental care companies.
- h. Environmental care companies have beneficial expertise for my company.
- i. There are great differences in the service offering of different environmental care companies.
- j. Environmental care companies can bring competitive advantage for my company.
- k. Sharing the cost-savings and benefits (bonus and sanction model) works well in environmental care contracts.
- l. Decision-making related to environmental care is in adequate organizational level in my organisation.
- m. I have consciously made beneficial decision for environment even though they have been economically unprofitable.
- n. Environmental care constitutes a great cost item for my company.
- o. Communicating our environmental responsibility to our customers should be developed.
- p. I second outsourcing those activities, which are not part of our core business.
- q. Our customers' environmental attitudes and requirements guide strongly our activities.
- r. Environmental legislation guides strongly our activities.
- s. Material efficiency has to be improved in my company.
- t. The level of environmental care has to be improved in my company.
- u. In my opinion it is pointless to strive to exceed the minimum environmental requirements in my company.

21. Any other comments on need related to environmental care issues or material efficiency?

22. The name of your company

Questions 5, 7, 9, 11, 14, 17, 18 and 20 have a set scale for answering the above-mentioned questions.