

LCA AND ADDED VALUE CREATION - CASE: STICKYX AND THE USAGE OF SUSTAINX TOOL

**Jyväskylä University School
of Business and Economics**

Master's thesis

2018

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ABSTRACT

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Title of thesis LCA and Added Value Creation – Case: StickyX and the Usage of SustainX Tool	
Discipline Corporate Environmental Management	Type of work Master's thesis
Time 04/2018	Number of pages 69
Abstract <p>Life cycle assessment, also known as LCA, can be used in multiple ways to create value. One of the value creation methods is using LCA based information as a consultancy tool to analyse the environmental performance of products. This Master's thesis investigates what are the value creation methods of LCA, whether and where the consultancy tool by StickyX called SustainX tool creates value to StickyX's business, what are the benefits and weaknesses and whether there are geographical differences in the experiences. A qualitative, descriptive study based on structured multiple-choice questionnaire was conducted to reveal existing usage of LCA and the added value potential of the SustainX tool. The results revealed that the SustainX tool creates added value to StickyX's business. Further analysis clarified that the added value creation potential differs depending on business end-use area, company type and region. The main benefits of the SustainX tool are support for brand image, information about environmental performance and promotion for sustainable products whereas the main weaknesses are lack of interest from printers, tool format being internal instead of external and uneven support for different business areas. This Master's thesis contributes to the research of LCA usage and provides knowledge about geographical differences on utilising LCA. However, this study is only focused on value creation through using LCA as a consultancy tool and thus there is a need for future research on geographical differences on other value creation methods.</p>	
Keywords life cycle assessment, LCA, added value, value creation, sustainability, self-adhesive, label, consultancy tool, European market,	
Location Jyväskylä University Library	



JYVÄSKYLÄN YLIOPISTO

TIIVISTELMÄ

Tekijä Noora Markkanen	
Työn nimi LCA ja lisäarvon tuottaminen – Tapaustutkimus: StickyX ja SustainX-työkalun käyttäminen	
Oppiaine Yritysten ympäristöjohtaminen	Työn laji Pro gradu
Aika 04/2018	Sivumäärä 69
Tiivistelmä <p>Elinkaariarviointia, josta käytetään myös lyhennettä LCA, voidaan käyttää monin eri tavoin liiketoiminnassa arvonluomisessa. Eräs tavoista on hyödyntää elinkaariarvioinnista saatua tietoa tuotteiden ympäristövaikutusten arviointiin konsultointityökalun muodossa. Tämä Pro gradu –tutkielma tarkastelee, mitä arvonluontimetoja elinkaariarviointiin liittyy, tuottaako StickyX:n konsultointityökalu nimeltä SustainX yritykselle arvoa, missä arvo luodaan, mitkä ovat konsultointityökalun edut ja heikkoudet ja onko tutkimuksessa havaittavissa kokemuksiin liittyviä maantieteellisiä eroja. Pro gradua varten suoritettiin strukturoitu monivalintakysely, jonka pohjalta tehtiin kuvaileva analyysi vallitsevasta elinkaariarvioinnin käytöstä ja SustainX –työkalun lisäarvon tuottopotentiaalista. Tutkimus osoitti, että SustainX tuottaa lisäarvoa StickyX-yritykselle ja arvonluomisen potentiaali riippuu liiketoiminnan loppukäyttöalueesta, yritystyyppistä ja maantieteellisestä sijainnista. Konsultointityökalun pääedut liittyvät brändimielikuvaan, tuotteiden ympäristöystävällisyyteen ja markkinointiin kun taas pääheikkoudet liittyvät kohderyhmän kiinnostuksen puutteeseen, työkalun toimintamalliin ja liiketoimintalueiden epätasaiseen tukemiseen. Tämä tutkielma tukee elinkaariarvioinnin hyödyntämisen tutkimusta ja tuottaa tietoa käytön maantieteellisistä eroista. Koska analyysi keskittyy lähinnä konsultointityökalun luomaan lisäarvoon, jää tutkimuskenttään edelleen tarve uudelle tutkimukselle liittyen muihin elinkaariarvioinnin arvonluontimeneelmiin sekä niiden mahdollisiin maantieteellisiin eroihin.</p>	
Asiasanat elinkaariarviointi, LCA, lisäarvo, arvonluominen, kestävä kehitys, tarraetiketti, konsultointi, työkalu, Eurooppa, markkinat	
Säilytyspaikka Jyväskylän Yliopiston Kirjasto	

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1 INTRODUCTION

1.1 Research background

This report will analyse how sustainability and more precisely, life cycle assessment, can create value to business. The concept is analysed by representing available literature and through a case study. The case study company is renamed for this report because of business reasons and the name used is StickyX. Also other brand names related to StickyX have been renamed for the same reason.

Life cycle assessment (also known as life cycle analysis and LCA) is a term that refers to a scientific methodology for analysing environmental impacts of a product or a service (Quinée, 2002; Baumann & Tillmann, 2004; Parent, Cucuzzella & Revéret, 2013). There are international standards for conducting a life cycle assessment by International Organization for Standardization (International Standardization Organization, 2006a & 2006b) that need to be followed to produce a generally acknowledged study. Life cycle assessment consists of four main steps, which are goal and scope definition, inventory analysis, impact assessment and improvement assessment (Baumann & Tillmann, 2004). As a result LCA can reveal where biggest impacts are coming and thus inspire to make improvements to product design (Parent et al. 2013). However, the information provided by LCA is comprehensive and can be ambiguous and therefore it is up to an organisation to decide which environmental impact categories are the most meaningful for them (Buxel et al., 2015).

The key term in this report is added value creation. Bowman and Ambrosini (2007) discuss about different value creation activities. The theory is based on assumption that the main purpose for a firm is to optimise profits. Thus value is something that increases profits or enables increasing profits in the future. Bowman and Ambrosini (2007) define five activities that are involved with the value creation being product creation activities, value realisation activities, input procurement activities, capital stock value creation activities and firm maintenance activities. From the mentioned for example capital stock value creation activities such as research and development are intended to generate future value, which cannot be demonstrated with monetary values (Bowman and Ambrosini, 2007).

Also Buxel et al. (2015) discuss about value creation. Their analyse focuses on what is the value creation potential of LCA in strategy development, research and development, supplier selection and production, marketing and sales and information, training and education. For Buxel et al. (2015) value can mean for example improving product design, differentiating product positioning, educated personnel or avoiding risks. Similarly with the value definition by Bowman and Ambrosini (2007), the common core denominator between several values presented by Buxel et al. (2015) is money. Improved product design can save raw materials or improve the green image of a product, differentiated

products are targeted to increase sales, employees with environmental mindset can change their behaviour in production location or become better salespeople and avoided risks can enable remarkable savings.

The literature review revealed that there is only limited amount of previous research available about the value creation methods of life cycle assessment. In most cases LCA is presented through case studies where the focus is on defined company and additionally often only concentrating to one environmental aspect. For this reason gathering applicable sources for this study has been challenging as case study results are rarely acceptable for further generalisation. However, this is also proving that there is need for research about the value creation methods of LCA.

The purpose of this study is to present the different value creation methods of LCA, present an example case of value creation through a case study about StickyX and analyse the value creation potential of LCA at the company from different perspectives.

1.2 Research questions

This report is linking current literature with a case study. The case study focuses on a company called StickyX (name changed) that utilises LCA based information as a consultancy tool called SustainX tool. The study is built on main research question (1) and two sub-questions (2 and 3). This study aims at answering (1) *whether and where the SustainX tool creates added value for StickyX's business*. As a part of the analysis this report will also define (2) *what are the differences in experiences between different countries and geographical areas about the added value creation* in order to bring knowledge about the LCA usage and potential in different markets. This study will also clarify (3) *what are the benefits and weaknesses of the SustainX tool defined by the tool users*.

This report is a combination of a case study and quantitative research. Data will be gathered and analysed by utilising quantitative methods but the overall report will be written as a case study. More precisely, the data will be collected by using a structured multiple-choice questionnaire and analysed with different statistical methods (Metsämuuronen, 2003). The results will not be generalised for common theories but more likely used for analysing the situation at the moment in the case company. In other words the topic will be analysed from descriptive approach. The report will combine the real-life example with industry specific information to theories regarding stakeholders, marketing and business.

This study will introduce the LCA usage in the case company and representative self-adhesive labelling industry. There is only little information available about the LCA usage in the self-adhesive labelling industry (FINAT, 2015; Pré Consultants, 2015) and therefore this study will provide important information for StickyX about the initial situation. At the moment, it is somewhat unclear whether the LCA-based SustainX tool creates value, how much it is being used, where is it used and above all where is the biggest potential and room

for improvement. In order to create business value through the SustainX tool it would be essential to find out what are the training needs and what are the weaknesses at the moment. If organisation does not see potential for added value creation what are the reasons behind? Are those related to technicalities of the tool or to the importance of the sustainability in the market? To conclude, this report will also provide information for StickyX about the value creation and gives opportunities to develop the SustainX tool further.

Moreover, the report will analyse value creation in different business end-use areas, company types and geographical areas focusing to Europe. There are several factors being studied such as knowledge level and organisational role to explain the differences in results. Regarding previous studies there is not much research available about the geographical perspective nor end-use areas or company types. The vast majority of previous studies related to LCA are case studies and represent random company examples from different industries mostly focusing on comparing different products or scenarios and thus cannot be seen as providing credible information about geographical differences. This study will create new information about LCA usage in different markets as a consultancy tool format. However, other value creation methods of LCA are not included in the analysis. Therefore, this discovered study gap would provide an opportunity for future research about the regional differences on utilising LCA for value creation through strategy development, research and development, sales and marketing, supplier selection and production and information, training and education.

2 SUSTAINABILITY IN ORGANISATIONS

Sustainability consists of the three pillars of the triple bottom line introduced by John Elkington in 1994, which are economic, environmental and social aspect (Elkington, 1997). Sustainability means a level of actions where all the three aspects of sustainability are taken into consideration without compromising the future actions. Similar ideology has been also introduced by using terms corporate social responsibility (CSR), corporate sustainability and corporate citizenship, which highlight the connection between sustainability and corporates (Andriof and McIntosh, 2001; Branco and Rodrigues, 2007).

Stakeholder theory presents that companies have a social responsibility towards all their stakeholders (Branco and Rodrigues, 2007). As Freeman described (1998), stakeholders are “groups and individuals who benefit from or are harmed by, and whose rights are violated or respected by, corporate actions”. According to Clarkson (1995), stakeholders can be divided into primary and secondary stakeholders. Primary stakeholders are those parties whose contribution is crucial for company’s survival such as shareholders, investors, employees, customers, suppliers, governments and communities. Secondary stakeholders are parties that can influence or affect or be influenced or affected by the company’s actions but do not have transactions with the company and therefore are not essential for company’s survival. The commonly debated challenge of stakeholder theory is the role of environment and also the absent stakeholders such as future generations (Branco and Rodrigues, 2007).

Sustainability has become a hot topic in corporate values and visions. What are the reasons behind? Global megatrends such as resource scarcity, water depletion, climate change and globalisation are starting to affect the companies. Also global discussions, Paris Climate Change Conference agreement and United Nations Sustainable Development Goals (also known as UN SDG’s) have created an atmosphere where big, global corporations are expected to take actions. However, there might be several reasons behind focusing on sustainable actions, which are either ethical or instrumental and strategic. The social activist perspective of the stakeholder theory suggests that companies are responsible to all their stakeholders and therefore should promote social interests even though not required by other parties. Instrumental approach also takes into consideration the interests of company’s stakeholders but for higher-level goals, such as profit maximisation, survival and business growth or for legitimising its activities by showing responsibility towards stakeholder norms and expectations. (Branco and Rodrigues, 2007)

Sometimes the real reason is a combination of both approaches as Smith (2003) explains. As the awareness of the global challenges is rising companies have pressure to act responsibly not only towards their shareholders but also to other stakeholders. Also the nature of media and especially social media are widening the accountability of the big corporates to cover also for example their sourcing value chain. Even though applying sustainability for strategic reasons

it will probably lead to social benefits because of the ethical nature of sustainability (Branco and Rodrigues, 2007).

3 LIFE CYCLE ASSESSMENT

3.1 Introduction

Life cycle assessment (also known as LCA) is a scientific method that measures the environmental impacts of a product or a service over its entire lifecycle starting from the raw material extraction, including steps of material processing, manufacturing, distribution, use, repair, maintenance and end-of-life processing varying from landfill and waste-to-energy to recycling (Quinée, 2002; Baumann & Tillmann, 2004). As Buxel et al. (2015) present the history of LCA methods started in the 1960's in the area of environmental and chemical engineering whereas the so-called modern LCA approaches started to develop in 1990's (Curran, 1996) and are nowadays regulated by ISO 14040 and ISO 14044 standards (International Standardization Organization, 2006a & 2006b).

Life cycle assessment can analyse a product or process from two perspectives – to define how big are the total environmental impacts and which lifecycle steps are the most critical in terms of environmental impacts. The latter can also be called as a hotspot. In the LCA there are several different environmental impact categories analysed in order to define the holistic picture of the environmental impacts. Typical impact categories are global warming potential, eutrophication potential, acidification potential, ozone layer depletion potential, reduction of non-renewable energy sources, water consumption and land-use. When targeting on decreasing the impact on one of the mentioned environmental issues the others may increase simultaneously. Therefore it is important to analyse the holistic view instead of concentrating only to one impact category. As an example, using post-consumer waste for producing materials might decrease CO₂ emissions but simultaneously increase the energy consumption because the processing and manufacturing of that recycled material is more energy intensive than producing a countervailing product from virgin material. (Buxel et al., 2015).

When studying the life cycle the environmental impacts are analysed in each process step separately and combined at the end to present the gross environmental impact. For example, energy consumption is defined separately in each life cycle step and the sum of those impacts is the gross energy consumption. However, in many cases a product life cycle includes also steps where for example waste can be utilised for energy production. In the LCA that energy production is calculated as a credit that is used to reduce the gross environmental score. Therefore the overall energy consumption of a product is a sum of the harmful and beneficial aspects of the impact category. (Buxel et al., 2015).

In addition to defining the total environmental impact the LCA can also be used for analysing the different steps in the life cycle and for finding out what are the biggest causes of the environmental impacts (Baumann and Tillmann, 2004; Buxel et al., 2015). After having information about the total environmental performance in each impact categories and knowing where the big-

gest hotspots lie the study can be utilised to further analyse different scenarios. Changing raw material or the amount, modifying processes, adjusting the choice of transportation vehicle or distance and switching end-of-life method for waste from landfill to recycling can have significant impact to the overall results. As stated by Buxel et al. (2015), this is the invaluable aspect of the whole LCA when improving products and processes to optimize their environmental performance.

The LCA methodology can be criticised because of the scope definition and assumptions needed to be made. Beyond the measurements there is also criticism towards the overall higher-level themes. As presented by Hall (2015), social and economic aspects are left out from LCA standards. This is seen as controversy to Elkington's triple bottom line thinking (Elkington, 1997).

3.2 Standards

As presented earlier there are two standards related to LCA being ISO 14040 that describes the principles and framework for conducting LCA (International Organization for Standardization, 2006a) and ISO 14044 that sets the requirements and provides more detailed guidelines (International Organization for Standardization, 2006b). The standards are created by ISO (the International Organization for Standardization) that is a worldwide federation of national standard bodies. The initial standards are from year 2006 but already before that there have been standards regarding the same topic.

International standards aim at unifying processes, studies and information for enabling people to talk on a same level regardless of the location. The process is controlled by national standard bodies. Additionally there are aggregated auditing parties that control the fulfilling of standard requirements. Unlike some other standards, ISO 14040 and ISO 14044 do not require auditing for fulfilling the requirements. Instead, there is a requirement for a critical review when the LCA study is intended to be used for a comparative assertion and disclosed to the public (International Organization for Standardization, 2006b).

Each life cycle assessment should be carried out by following ISO 14040 and ISO 14044. Thus the methodology is the same. However, there still remains quite a lot of room for variation regarding scope definition, data collection, data availability and assumptions. These variables are the reason why results from different LCA studies should never be compared together.

3.3 Method

As several authors describe (Baumann & Tillmann, 2004; Buxel et al., 2015) based on International Standardization Organization (2006a), life cycle assessment has four main steps that are goal and scope definition, inventory analysis,

impact assessment and improvement assessment. Each step has to be taken in order to conduct a LCA.

The first main step requires making definitions starting from defining the goal for the assessment (International Organization for Standardization, 2006b). What is the organisation looking forward to study? The goal can for example be to find out the impact to the environmental performance when changing the package design from hard plastic container into flexible package. To be able to conduct the study a functional unit needs to be defined. In cases where the package size is different between the conventional and new design having a functional unit defined as X amount of packages would not give proper comparison. Therefore a better functional unit would for example be "carrying 1000ml of laundry detergent". After defining the goal and the functional unit it needs to be defined what are the environmental impact categories to be analysed. As presented earlier, LCA can provide tens of different environmental impact categories and the organisation needs to define what are the most relevant indicators for their usage. It might be good to make a sensitivity analysis to make sure that all relevant environmental impact categories are taken into consideration. (International Organization for Standardization, 2006b) The fourth definition within the first step of LCA is to define the system boundaries. In other words go through the processes in the flow chart format and decide to include or exclude certain processes from the study. The exclusions need to be separately explained in the study to make sure no significant processes have been left out. Moreover, according the ISO 14044 (International Organization for Standardization, 2006b), all materials and processes contributing more than a defined amount (for example >1%) to the need to be involved in the study. (Buxel et al., 2015).

The second step of the life cycle assessment is the inventory analysis (International Organization for Standardization, 2006a & 2006b). In practise the analysis is done by going through each included process within the system boundaries and defining the input and output flows. This information collection covers all relevant process data such as raw materials, energy, water, waste and by-product amounts and types. So for example the packaging process in the laundry detergent packages has raw material flows covering containers, corks, labels, cardboard boxes and the laundry detergent itself and simultaneously energy needed and waste created in the packaging line. (Buxel et al., 2015).

After having the inventory analysis in place the input and output flows need to be transformed into environmental impacts (Baumann & Tillmann, 2004; Buxel et al., 2015). As ISO 14044 presents (International Organization for Standardization, 2006b), impact assessment can be done by utilising primary and secondary data. Life cycle assessment normally utilises primary data for own processes such as for the amounts of laundry detergent produced and the energy needed for that. As the organisation normally does not have visibility into data above its system boundaries or earlier in the supply chain there is also a possibility to use secondary data. That can be used for example to determine the emissions created by the energy production. In practise the energy production data is a combination of different energy sources typical in the geographical re-

gion representing so-called grid mix or a chosen energy source for example solar power. By utilising comprehensive data the input and output flows from each life cycle steps can be transformed into environmental impact categories (Buxel et al., 2015).

The last phase of the LCA is improvement assessment. As presented by several authors (Baumann and Tillmann, 2004; Buxel et al., 2015), having several scenarios for example for a product design or raw material choice enables comparing results together to see how they perform in each environmental impact category. The assessment also shows how different production steps are contributing to the overall environmental performance.

4 ADDED VALUE CREATION THROUGH SUSTAINABILITY AND LCA

4.1 Benefits of sustainability

As presented earlier, the decision to engage in sustainability in corporations can be either ethical or strategic. From resource-based perspective (RBP) the reasons are the internal and external benefits provided by sustainability (Branco and Rodrigues, 2006).

Engaging with sustainability may support the company to develop new innovative products and leaner processes with decreased environmental impacts to lead the company into more efficient use of resources. That presumably creates direct savings to the company. Another internal benefit is seeing the waste as a saleable by-product, which could create savings from waste costs and even create revenue from the sales. Moreover, being recognised as a responsible company may be one of the key features needed to sign a deal with certain markets or brands. (Branco and Rodrigues, 2006).

The external benefits are related to company image. As presented by Branco and Rodrigues (2006), companies with good sustainability reputation can have closer relations with their stakeholders, such as customers, brand owners, suppliers and investors. Improved relations can lead into better business contracts and create economic benefits that way. As mentioned above sustainability focus can be visible in the new innovative materials and products and also in the improved efficiency of the processes. These internal benefits can also have an external angle when the actions are communicated externally. Having more environmental friendly products available can create new business and thus revenue. Also publishing environmental emission reductions in the production units may improve the company image. (Branco and Rodrigues, 2006).

Sustainability can be seen benefitting company as a whole at least in the long run (Branco and Rodrigues, 2007; Smith 2003). However, it can be criticized that sustainability is rather a competitive advantage than the desired outcome and if sustainability actions are not directly linked to company's operations the actions can be copied by competitors and the competitive advantage will be lost (Branco and Rodrigues, 2006; Branco and Rodrigues 2007).

Life cycle assessment is one method for enabling some of the above-mentioned internal or external benefits. As Buxel et al. (2015) explain, LCA is an impressive tool to support decision-making in terms of environmental performance. The value of LCA can be visible in strategy development, research and product development, supplier selection and production, marketing, sales, information exchanging, training and education.

4.2 Strategy development with LCA

As presented earlier LCA is a powerful tool to find out the hotspots of the processes and materials and therefore it can reveal information that an organization was not able get otherwise. For that reason LCA can be a helpful tool in strategy development. One of the so-called winning competitive positioning strategies by Michael Porter was defined to be differentiation (Kotler et al. 2013). When companies differentiate their products in a way that are valued by customers they might be able to charge a premium price or offer superior product compared to their competitors and thus win market share (Bowman and Ambrosini, 2007). By using LCA a company can make a strategic decision to create a product line and marketing program that helps it to be recognized as the class leader in the industry (Kotler et al. 2013). Offering LCA calculations might also be seen as a service that customers would be willing to pay premium in addition to their normal products according to Bowman's and Ambrosini's theory (2007).

As Buxel et al. (2015) present, the systematic analysis of critical sustainability issues allows defining risks and opportunities in the processes of the company. This enables creating strategies for meeting the future business environment requirements. It might mean changing the product properties, raw material or even creating a new service. For example, Procter and Gamble studied the environmental impacts of laundry detergents and washing processes and found out that the biggest cause for environmental impacts is the heating of the water for the washing machines. Therefore Procter and Gamble created a laundry detergent for gold waters that results a similar washing quality no matter washed in 15° or 40°C degrees. (Buxel et al., 2015)

The LCA can also reveal that an alternative raw material would give environmental benefits (Baumann and Tillmann, 2004). That might mean changing the packaging into different material for example from rigid plastic container into plastic pouches or instead of producing hand soap in disposable bottles producing also fill-in packages in the form of plastic pouches to decrease the need for plastic packaging and thus reducing environmental impacts. Moving towards new packaging design might require internal resources but sometimes also acquiring new technologies, which requires a high-level strategic decision.

Sometimes the LCA can also reveal that the business in its initial form would not be strong enough to response to the future needs of the market. As Buxel et al. (2015) present, an industrial packaging product and service company Greif Inc. faced a demand from their customers towards providing environmental information from their products including Greif's industrial shipping containers. After conducting LCA Greif found out that instead of having full containers or light weighting the containers the most efficient way of decreasing environmental burden is to build strong containers and recondition them. The strategy was redirected to focus on creating a new service for offering reusability service for containers. Through a few acquisitions Greif broadened their expertise and finally created a service company for collecting old

containers and reconditioning them for reuse. The service is nowadays a remarkable factor in Greif's revenue. (Buxel et al., 2015)

4.3 Research and product development with LCA

In addition to strategy development LCA can also support research and product development. Buxel et al. (2015) present three ways how LCA can benefit research and product design.

As explained previously, LCA reveals the hotspots meaning critical raw materials and product steps. Thus LCA gives a possibility for comparing different raw materials within the existing product design in order to define the raw material that has the lowest environmental impacts (Buxel et al., 2015; Parent et al. 2013). This might mean comparing fossil raw materials against biobased materials or comparing totally different raw materials such as plastic, aluminium, cardboard, glass and so on. Example presented by Buxel et al. (2015) reveal that Nestlé used LCA for comparing different raw materials for coffee capsules with different end-of-life processes including disposal and recycling. They found out that instead of changing coffee capsules into alternative raw material such as plastic or bioplastic remaining with aluminium capsules is the best choice from environmental perspective as long as aluminium capsules are being recycled. Nestlé decided to concentrate on improving the recycling possibilities and has been increasing the re-collection by organising new collection points and recycling systems (Buxel et al., 2015). One might however question whether a private consumer would collect his aluminium capsules and take them to a collection point and whether it would have been more sustainable choice to use other materials for capsules that could have resulted into lower emissions even when ending up to waste-to-energy plant together with other municipality waste.

LCA can also stimulate new product designs where changing the product design or its production process leads into environmental benefits (Buxel et al., 2015; Parent et al. 2013). According to general knowledge about LCA in those cases where raw materials are the biggest cause for environmental impacts light weighting is an easy solution for improving the environmental performance. But for example in the case of toilet seats the most significant life cycle step is the use phase and more precisely the water usage. There the biggest environmental improvement can be achieved by designing toilet seats with low water consumption rather than light weighting the toilet seat. In other words, ecodesigning the product by improving its technical performance (Hauschild, Jeswiet & Alting, 2005).

LCA utilisation can change the way company is looking at their product offering and give new ideas for product design (Buxel et al., 2015; Parent et al. 2013). It can reveal something significant that could be utilised as an opportunity to gain extra income or develop new products and services or. This could mean for example starting to see waste as a saleable by-product for creating additional revenue (Branco and Rodrigues, 2006). So for example instead of paying waste fee of left-over wires selling those for waste recyclers to extract alu-

minium for further usage. Another example of using LCA for new product design idea is presented by Buxel et al. (2015). They describe that AEG was analysing their washing machine design concentrating into the weights that are used in the machines to prevent them from vibrating. AEG was reviewing different materials but it turned out that the best solution from environmental performance perspective was to remain using concrete as weight but change the design so that it enables dismantling of the washing machine and recycling different appliance parts.

For getting a concrete value of LCA regarding research and product development the information gained from LCA can be combined with other decision-making criteria such as cost and performance to conclude an eco-improvement analysis. In the analysis the defined actions from environmental performance perspective can be analysed with the linked costs and possible changes to the product performance (Buxel et al., 2015). Economic aspect can also be analysed by using environmental life cycle costing (ELCC) that can be seen as the economic pillar for the triple bottom line theory by Elkington. Criticisms emphasise that the relevance of ELCC to a decision maker might limit the relevance of sustainability (Hall, 2015). Thus it can be questioned whether the findings through LCA for research and development are seen relevant when those new innovations or product developments would require lots of money.

4.4 Supplier selection and production with LCA

LCA can also give value for supplier selection and production through the information that is revealed about the environmental performance of products and production processes (Buxel et al., 2015). The procurement can be optimised and production processes improved from sustainability perspective. When combined with other attributes such as relative price and quality performance the LCA information can be used for eco-efficiency portfolio analysis to support purchasing decisions (Buxel et al., 2015). Also social aspect could be included into the analysis through utilising social life cycle analysis (SLCA), which provides information about the social performance of parties involved in the activities during the product life cycle (Parent et al. 2013; UNEP-SETAC, 2009).

As presented earlier, LCA can be used reviewing raw materials and comparing alternative raw materials, which might lead into changing a supplier. Buxel et al. (2015) present a case of a company called Staples that is a multinational office supply retailing corporation. Staples started using LCA for their paper procurement and as an outcome increased the amount of supply coming from post-consumer recycling. They also produced a technology together with local farming community to create slurry of the crop cultivation left-over plant material that can be used for paper production.

The information gained from LCA can also be used for choosing suppliers that are local or as local as possible to optimise the transportation needs and decrease environmental impacts. The role of transportation is important also at

the end-of-life for products that are being recycled by consumers after use. This was also demonstrated by a clothing company Patagonia that is recycling customers' used clothes through their own program called Common Threads Initiative (Buxel et al., 2015). Their garment recycling is done by shipping materials into Japan where they are used for polyester production. Patagonia used LCA to study whether the transportation into Japan invalidates the benefits of using old clothes for polyester production. It turned out that the transportation to Japan is not a significant factor but the remarkable cause for environmental impacts is coming from private consumers dropping of old clothes to Patagonia stores. As an outcome Patagonia optimised their recycling system, enabled returning garments by mail and encouraged avoiding dropping-off option if driving only for that reason. (Buxel et al., 2015)

The value of LCA can also come from providing information for improving own production processes. The review can reveal hotspots for example about energy consumption, raw material use and waste rate or waste handling. It might turn out that renewing a machine could lead into significant money savings similarly reducing environmental impacts. Or that changing lighting into energy-efficient LED lamps and automating can save energy. LCA also gives the possibility for considering the source of energy and may offer tools to the management for justifying the change from fossil source into more expensive but sustainable renewable energy.

4.5 Marketing and sales with LCA

LCA is not only remarkable tool for internal development but also for processes that are related to customer-related actions such as marketing and sales. The added value for marketing and sales is a combination of the following aspects (Branco & Rodrigues, 2006, 122; Buxel et al., 2015).

First of all, utilizing LCA enables a company to make comparisons between different products from environmental perspective. The results can be used for product differentiating and marketing to increase the customer value (Branco & Rodrigues, 2006; Buxel et al., 2015; Kotler et al., 2013). For example, switching to biobased plastics gives clear marketing communications opportunity with sustainability positioning. However, as Branco and Rodrigues (2006) present the competitive advantage can be enjoyed only as long as the new processes are unique. Another limitation regarding product differentiation through product comparisons is related to the guidance of the ISO 14040 standard. According to ISO 14040 standard (International Organization for Standardization, 2006a) LCA has always its system boundaries and scope which define the aspects included in the analysis. When competitor's production is not included in the LCA, neither can the products be analysed in the study. To conclude, comparisons enabled by LCA can only be done within the same study.

When environmental performance becomes one of the marketing messages also the purchasing criteria can be affected. In other words sustainability becomes an aspect in the purchasing decisions. To promote being environmen-

tally responsible a company might utilise LCA information in a larger scale. For example a case presented by Buxel et al. (2015) describe how global IT and communication service provider Orange has created a LCA based communication tool to support the sales of their service. The online tool can be used independently for calculating potential greenhouse gas emission savings when instead of organising physical meetings companies use web-conferences. The similar case by StickyX will be presented later in this report.

Third implication of the value in regards of marketing and sales is the so-called “door-opening” aspect. As presented by Kotler et al. (2013), supplier are “gate-keepers” who want to limit the amount of information whereas for example marketing and business development functions are so-called influencers. As a result of using LCA for product marketing and sales purposes the salesperson might get past the purchaser to discuss with the influencers. That might lead into forward-looking conversations where companies can discuss about prevailing sustainability challenges and decide about joint development projects (Buxel et al., 2015). This can strengthen the business relationship, which again might lead into ensuring the continuation of the business or increasing the business by revenue. Also this “door-opening” aspect will be discussed later in regards of the case StickyX.

4.6 Information, training and education with LCA

Additionally to other presented value creation factors LCA can bring value to the organization by providing information, enabling training and education (Buxel et al., 2015). The fact-based information gained from a study can be shared with different stakeholders such as suppliers, customers, employees and investors. Information sharing leads into conversations, which is a necessary step first to raise the environmental awareness and secondly shape organisation and its stakeholders into sustainability focused thinking.

Information gained through LCA can also be used for training employees, which raises the knowledge levels in the organisation and thus creates value to human resources. But the training can also lead into concrete actions such as understanding reasons behind energy saving targets and giving inspiration to work towards that or start to see possibilities in creating new products from alternative raw materials.

The value can also come from education and being notified as an educator. When organisation studies its life cycle there might be some new and interesting findings that could benefit a wider audience. Buxel et al. (2015) present two cases where companies have shared their findings with their stakeholders. The European Aluminium Foil Association (EAFA) studied several food packages where aluminium plays a role such as coffee containers, soup pouches, ready-to-serve meals and chocolate bars. It turned out that the environmental impact from aluminium was still relatively low when compared to other impact factors like raw materials, cooking and transportation. The other case presented Nestlé Waters North America that wanted to study the environmental perfor-

mance of bottled water together with available alternatives. They included tap water into analysis and in fact found out that tap water would be the most sustainable option.

The difference between the presented cases is that other study provided supportive results while the other could harm the business of the firm. However, both companies decided to share their findings with a public general. EAFA was able to educate the audience about the role of aluminium and also contribute to the discussion about consumption and the sustainability of food production. Nestlé Waters North America, on the other hand, could have decided not to publish the results that were not in favour for them but decided to make results public to provide fact-based information to the general discussion about bottled beverages. (Buxel et al., 2015)

4.7 Interactive consultancy tool with LCA

Even more developed way of getting added value from LCA is related to utilising it with customer communications. Buxel et al. (2015) present an example from an industrial packaging company called Greif Inc. that took pro-active angle to sharing environmental information with their customers. They developed a specific calculator tool based on LCA, which enables their customers to compare different packaging solutions together by adjusting parameters and thus creating several what-if scenarios. That might mean adjusting transportation distances, recycling rate of the package or reconditioning. The tool got high attention from Greif's customers but there was an interesting finding made. Normally Greif is in contact with their customers' purchasing organisation but because of the LCA tool also people from marketing, sales and sustainability organisations were becoming contacts. Those people are in general seen as core decision makers in packaging design and therefore discussions initiated because of the LCA tool lead into new business opportunities and joint business process development. Similar case with StickyX will be presented later in this report with more detail. (Buxel et al., 2015)

5 CASE STICKYX

5.1 General information

FamilyX is a multinational company operating in the forest industry. The company is currently present in 45 different countries and has 54 production plants in 12 countries employing 19 300 employees worldwide. In 2016, the company's sales were approximately 9,8 billion euros. The company is divided into six business areas, which are Paper ENA, Plywood, Energy, Specialty Papers, StickyX and Biorefining. In addition to those business areas FamilyX has so called new businesses, which are not yet defined as their own business units. (UPM, 2017)

FamilyX has a strategy called BioFore with vision of sustainable future by integrating bio and forest industries. The strategy guides FamilyX to reach its responsibility targets for 2030 that are aligned with United Nations' Sustainability Development Goals (also known as SDG's). Targets cover all sides of sustainability - economic, environmental and social. (UPM, 2017; United Nations, 2018).

StickyX is a self-adhesive label manufacture company and belongs to FamilyX. StickyX is the second largest company in the industry and has operations in all continents - 10 factories, 26 slitting terminals and several sales offices employing 3000 people. In 2016, the sales were approximately 1,4 million Euros (UPM, 2017).

StickyX has 12 end-use areas, which are A4 & cut-size, beverage, food, durables, home & personal care, oil & industrial chemicals, pharmaceutical & healthcare, retail, security & brand protection, transport & logistics, tyre and wine & spirits (UPM, 2018a). Serving wide range of end-use areas requires variety of products with different technical and visual properties. Altogether, StickyX produces around 8000 different types of products per year. Self-adhesive labelstock laminate typically consists of four main layers: face, adhesive, silicone and liner (UPM, 2018b).

Self-adhesive labelstock can be adhered to a variety of substrates with applied pressure rather than chemical or mechanical activation. Other available and competing labelling technologies are cut and stack glue applied labels, in-mould labelling, shrink sleeves and direct digital printing. Cut and stack glue applied labels are more economical but also more sensitive to wrinkling and edge lifting with weaker durability than self-adhesive laminates. In-mould labelling is used in the plastic moulding processes where label becomes an integral part of a plastic container. Shrink sleeves are a raising labelling technology where the entire package is covered with plastic label. Shrink sleeves have been used in the United States already some time but the technology is getting more popular nowadays also in Europe. Another competing technology for self-adhesive labelstock is direct digital printing, which is used for product decoration where high level of individual customization is needed. This could be the

case for example with beverage cans where the brand owner would print several thousand human names as part of their product campaign. (FINAT, 2015; Alexander Watson Associates, 2017)

5.2 Value chain and decision-making

To enable efficient analysis of added value creation later in this report the nature of self-adhesive labelstock value chain needs to be described including its decision-making process. Due to the lack of literature sources related to the topic the following description is based on general knowledge gained working in the labelling industry.

Typical value chain of self-adhesive labelstock industry is described in figure 1. For the analysis it is most important to understand the relations between self-adhesive labelstock producer, printer and brand owner. There are around dozen self-adhesive labelstock producers operating in each continent, from which only two are global companies having regional competitors. These companies are reasonably big having several departments with specialised experts. Their customers, printers, are small and medium sized companies and quite often family-owned businesses where small group of people is handling all operations. Typically printers operate locally with a few exceptions of global printers. Brand owners can be small but also enormous global companies with several brands. Big brand owners are similar players as self-adhesive labelstock producers from organisation perspective and have departments specialising in different topics.

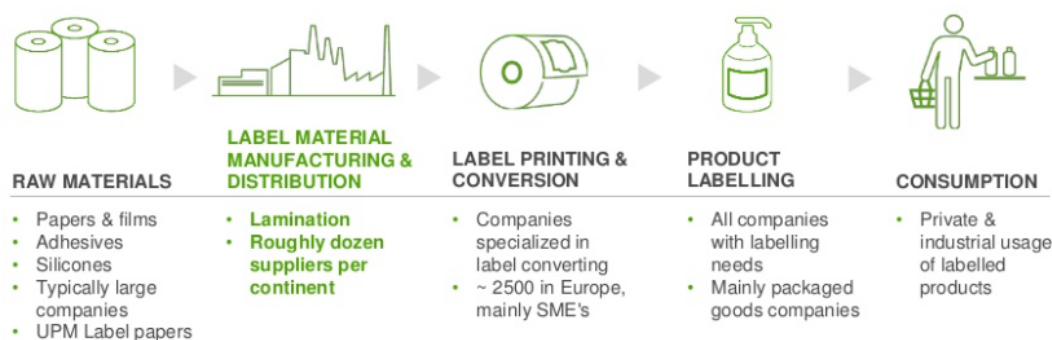


FIGURE 1. Labelstock value chain.

Normally in business-to-business value chains sales is selling to the purchasers of their customer companies. What is typical in this kind of situation is that sales is trying to increase their profit by either selling more or products with added value and trying to find new angles to push their messages through. Purchasers, on the other hand, are so-called gatekeepers in the organisation and trying to negotiate only about the prices and keep the visibility to the company as low as possible (Kotler et al. 2013). In other words purchasers are not inter-

ested to hear about new solutions if the need does not come from inside of their organisation. This general rule applies to the business relationships of both the self-adhesive labelstock producer and printer and between printer and brand owner. The opportunity to talk about sustainable products and solutions might come when the message is forwarded to relevant people in the organisation by the purchaser or the need comes from inside for example from packaging designers or sustainability organisation which are also known to be influencers (Kotler et al. 2013).

Another important aspect to understand in the labelstock value chain is the lack of visibility. Typically printers are purchasing labelstock material without specifying the destination of the material meaning the brand owner, end-product or region. This creates challenges for example when self-adhesive labelstock producer is asked to provide information about recyclability of the products but that is another topic and will not be handled in this report. The visibility is controlled by printers to avoid enabling the decision-making power to switch from printers to bigger players; brand owners and self-adhesive labelstock producers. Otherwise brand owners could agree directly with self-adhesive labelstock producers about the labels and specify those in their purchasing contract with printers, which would limit the possibility of the printers to manage their own raw material costs by having supplier defined in advance. The lack of visibility also weakens the possibility of brand owners to hear about sustainable solutions. As an exception, some printers might utilise the knowledge of their suppliers to support them to answer the needs of the brand owners. This might enable closer cooperation between self-adhesive labelstock producers and brand owners and have sustainability people from both organisations involved in the discussion.

5.3 LCA in the self-adhesive labelling industry

LCA is relatively new method in the self-adhesive labelling industry. The position of LCA was studied in 2015-2016 by the European association for self-adhesive label industry (FINAT) in cooperation with its American counterpart Tag and Label Manufacturers Institute (TLMI). The study was aimed to analyse the current situation and create harmonised sector guidelines for conducting LCA (FINAT, 2016). This chapter will concentrate on the European market because the visibility for other markets is limited.

As part of the LCA harmonising project Pré Consultants bv made a state-of-practise analysis about the use of LCA in the self-adhesive labelling industry (FINAT, 2016). The survey was sent to all FINAT and TLMI members who were asked to answer about their current sustainability policy, views towards LCA and recommendations for development. There were 98 answers to the questionnaire from which 36% were raw material producers, 45% labelstock material producers and 24% printers (PRÉ Consultants bv, 2015).

According the study (PRÉ Consultants bv, 2015) only 14% of the companies were utilising LCA in their company and what also became clear not a sin-

gle printer was using LCA. The study also revealed that from those companies not using LCA 58% were not familiar with the method or its applications. Moreover especially with printers the number was as high as 68%. Thus it can be concluded that printers do not use LCA and most of the companies do not even understand the method. However, slightly over half of the companies not using LCA stated that they plan to use it in the future for improving operational performance (70% of the respondents), marketing and product branding (65% of the respondents), corporate social responsibility program (53% of the respondents) and development and design of sustainable products (37% of the respondents). The limitations of using LCA were defined to be lack of internal knowledge (54% of the respondents), lack of dedicated personnel (68% of the respondents) and limitations of time and budget (51% of the respondents). (PRÉ Consultants bv, 2015)

As presented earlier, LCA can add value to organisation through strategy, research and development, marketing, sales, supplier selection, operations, information sharing and education and as an interactive consultancy tool (Buxel et al., 2015). These aspects were also defined by the questionnaire respondents using LCA. 80% of the respondents stated using LCA for marketing, 50% for improving operations, 50% for product development and 40% for supplier selection. Moreover, 30% of the companies stated using interactive consultancy tool. (PRÉ Consultants bv, 2015)

A separate market study was conducted to find out what is the role of LCA for brand owners. Over 70 respondents represented both smaller regional and larger global brand owners and variety of different end-use areas such as food, home and personal care, beverage, pharma, industrial chemicals, durable applications and retail. The people answering the questionnaire or being interviewed were mostly packaging engineers (45%) but also from sourcing, R&D and marketing departments. When asked how important it is that your label supplier is using LCA only 6% stated it being critical, 48% thought it is increasingly important, 33% said it is somewhat important and 13% did not value using LCA. (FINAT, 2015)

5.4 LCA in StickyX

As being part of FamilyX, StickyX has a strong sustainability mindset and aims at being a frontrunner in sustainability in the self-adhesive label industry. One part of StickyX's sustainability approach is to utilize life cycle assessment. StickyX conducted its first LCA study in 2012 with help of Thinkstep and GaBi software. The LCA was done to find out the hotspots in the value chain and make improvements. In 2013, StickyX launched an online tool called SustainX, which is a communication tool built on the basis of life cycle assessment. The tool is used for interactive consultancy purposes similarly as presented by Buxel et al. (2015). StickyX's LCA is conducted according to ISO 14040 and ISO 14044 standards and have been critically reviewed by an independent third

party (UPM, 2018c). LCA is utilized in StickyX in several ways but the main focus in this report will be concentrating to SustainX tool.

SustainX tool presents three environmental impact categories, which are greenhouse gas emissions, energy consumption and water usage (UPM, 2018c). The three indicators have been chosen to represent the most common topics of brand owners' targets. In 2016, the tool had around 700 StickyX products available for three different business regions – EMEIA, Americas and APAC. In the tool the user can choose one or two products for analysis. By making a comparison between two products user can for example see what is the difference of choosing filmic liner instead of paper liner or what are the environmental impacts of choosing thinner and lighter material instead of a standard material. The user needs to define also the assumed end-of-life treatment for the liner material whether it is landfill, incineration or recycling. Choosing between the three end-of-life treatments can have a significant effect to the overall results.

The SustainX tool works in StickyX Intranet but can be used together with customers and end-users. The main purpose of the tool is to provide environmental information about the products, present the environmental benefits of switching to so called ecodesigned products (meaning products that have been designed to meet sustainability requirements and have lower environmental impact as explained by Hauschild et al. (2005)) and illustrate the importance of handling the liner waste responsibly. The SustainX tool allows making different scenarios by adjusting parameters related to products, end-of-life processes and volumes similarly to interactive consultancy tool presented by Buxel et al. (2015). The information helps customers and end-users to understand the environmental impacts of their purchasing decisions without the need of conducting resource-intensive LCA study by themselves. The SustainX tool is mainly used for product marketing by the sales and business organization.

The life cycle assessment of StickyX is not only used behind the SustainX tool. It is a wider concept, which has continuously been developed during the few last years. As Buxel et al. (2015) present, having interactive consultancy tool can strengthen contacts to customers beyond purchasing department and allow discussing about LCA findings, which might lead into joint business development opportunities. When StickyX presented their SustainX tool to Unilever through their customer Unilever wanted to study further the environmental impacts of printing process. StickyX, Unilever and a global leading converter made a cooperation LCA project in 2013 where compared different printing technologies and different label materials (UPM, 2013). The project revealed information about the significance of the printing design choices and gave added value through external communications and strengthened business relationship.

Through the project StickyX has the most comprehensive life cycle assessment in the labeling industry including processes not only from its own operations but also a model covering printing house processes and dispensing at the brand owner's location (PRé Consultants bv, 2015). However, the printing section or dispensing are not included in the SustainX tool results because the impacts of different printing technologies vary significantly as found out in the joint study with Unilever (UPM, 2013). The printing and dispensing sections of

the LCA can be utilized for more tailored analysis where the correct data is separately collected from a printing company or brand owner.

Another example of the benefit of having an interactive consultancy tool to open discussions around LCA and later lead into joint project is the cooperation between StickyX and an Italian winery, Cielo e Terra. In 2016, the two parties in the value chain partnered for assessing the environmental impacts of wine bottles. In practice the LCA model of StickyX was widened to cover also the processes at Cielo e Terra's bottling unit. The study focused on finding the hotspots of the wine bottling processes and clarifying the environmental impacts of different raw materials. (UPM, 2016)

By using the GaBi software StickyX can conduct life cycle assessments for different purposes and modify the information based on the particular needs. For example, research and development function utilizes LCA at their work. As Branco and Rodrigues (2006) presented about the benefits of sustainability the engagement to sustainability may lead into developing innovative products and leaner processes with decreased environmental impacts. The same theory holds for LCA - thanks to the LCA StickyX has been able to define the hotspots in their own value chain and is able to design products that can significantly decrease the environmental impacts.

Another internal benefit defined by Branco and Rodrigues (2006) is seeing the waste as a saleable by-product for revenue creation. This has been utilized at StickyX in the form of a waste recycling concept called CircleX, which is a service provided to printers and brand owners to collect back the label waste and utilize it as a raw material in other FamilyX businesses (UPM, 2018d). As presented earlier the LCA can bring value to strategy development (Buxel et al. (2015). This has been also the case with CircleX concept. The concept started in its original form in 2007 as a pilot and did not play strategically important role at the beginning. The LCA was made in 2012 and as presented earlier one of the revealed hotspots was the end-of-life choice for liner meaning landfill, waste-to-energy or recycling. The strategy towards CircleX concept changed and it became a crucial part of the sustainability story of StickyX. Today, CircleX concept is truly circular recycling solution in the self-adhesive labeling industry, helps engaging with brand owners and also supports the circular economy vision of FamilyX corporation (UPM, 2018d).

LCA is not only adding value through sales and marketing, research and development and strategy development but also through education and info-sharing opportunities. LCA has revealed information about StickyX's operations and products that has enabled training employees and other stakeholders like customers and brand-owners. Increasing the awareness of the employees has supported improving waste separation processes and working towards zero waste to landfill target. LCA has also enabled training value chain members about making sustainable product choices. To conclude, life cycle assessment is one of the key parts in the StickyX sustainability brand.

6 STUDY METHOD

6.1 Quantitative approach

As presented earlier LCA can bring value to an organization through strategy development, research and product development, supplier selection and production, marketing and sales, information, training and education and interactive consultancy tool (Buxel et al., 2015). However, this empirical study will only concentrate to the value creation through using interactive consultancy tool and is based on the case study made at StickyX about their consultancy tool called SustainX.

The study utilizes a quantitative approach and is based on a structured multiple-choice questionnaire. According to Valli (2017), using questionnaires for scientific studies has become a commonly used method for data collection. The quantitative approach was chosen because it was a logical way of studying the phenomena of LCA's added value creation potential and provided opportunity for analysis through comparisons, causalities and other numerical methods. The study method was decided based on sample size and realities related to the different locations of the people. Thus a structured multiple-choice questionnaire was chosen to be conducted as an e-survey, which means using e-mail or Internet survey and in this case meaning using an Internet-based software called Qualtrics. As Valli (2017) describes, e-surveys do not have geographical limitations even when gathering large amount of data from wide area.

This study aims at answering (1) whether and where the SustainX tool creates added value for StickyX's business. There are also a few sub-questions studied which aim at defining (2) what are the differences in experiences between different countries and geographical areas regarding the added value creation and (3) what are the benefits and weaknesses of the SustainX tool defined by the tool users.

6.2 Data collection

As described earlier the data was collected by using a structured multiple-choice questionnaire. As Valli (2017) describes, one of the biggest risks for the study is creating bad questions that for example lead the respondent or can be understood differently. Before the data collection was started there were some definitions made regarding the study scope, topic, sample size and of course the data collection method and timeline.

The scope of the study was the European market region of StickyX. The European market was chosen because the SustainX tool had been longest in use compared to other regions. Thus it was expected that people in the European market have already internalized the SustainX tool and its possibilities as well

are aware of the weaknesses. The sample was defined by using a non-random sampling method to reach the relevant people and ensure sufficient number of response (Metsämuuronen, 2003). In other words sample covered the whole group instead of randomly choosing the respondents. The sample included sales and business organisation, which means jobs varying from customer service, field sales and technical sales to business development, product owners and marketing positions.

The expectation was that the response rate could be low due to busy business situation and general laconic attitude towards questionnaires. To avoid insufficient response rate the questionnaire was marketed through several channels including face-to-face meetings, personal email and internal chatting channel. There were also two reminders being sent for people who had not conducted the questionnaire. The questionnaire was open for 3 weeks to ensure sufficient time for answering but not to create a perception of having lots of time to answer.

As mentioned earlier, the questionnaire was done by using a web-based software called Qualtrics. The software allows creating different questionnaire path for users answering differently, sending questionnaire through email, seeing answers on a respondent level, sending automatic reminders and analysing results through different quantitative methods. The software also allows the user to analyse answers that have been given as anonymous with full details including respondent email addresses, which of course could be ethically questioned. Although, without tracking on a respondent level some of the further analysis may not be made. The questionnaire made also ensured confidentiality to the respondents to allow people answering freely. Therefore the personal level information was not analysed in this study and none of the answers were connected with personal details.

The questionnaire was made into the form of multiple-choice questionnaire (appendix 1). There were 20 questions from which the first 18 were included in the analysis. The questionnaire structure looked different to respondents depending what they answered to certain questions. For example, if a respondent answered that he had not used SustainX tool the questionnaire continued only for one more question whereas others had still several questions to go (appendix 1).

6.3 Data analysis

Valli (2017) presents that the form of an individual question determines what scale is in question and how the data collected can be analysed. Thus the pre-work of planning the survey is crucial in order to get applicable data for analysis. The questionnaire was built to provide answers to the research questions.

Some of the measurement scales used were nominal, some ratio and others interval and even more specifically Likert scale. Nominal measurement scale was used in questions when the qualitative variables were measured such as respondents' department (Metsämuuronen, 2003). The beginning of the data

analysis concentrates on defining who are the SustainX users and is the coverage of the sample comprehensive from organisational, regional and age perspective. First part of the analysis also clarifies how the SustainX tool is being used to provide background information for further analysis.

The main research question aims at answering (1) whether and where the SustainX tool creates added value for StickyX's business. This was studied by asking about the added value potential in certain markets, end-use areas and company types (appendix 1). The questions provided a possibility to state that there is no value at all. Thus, these questions represented ratio measurement scale that has an absolute zero where the measured quality does not exist (Metsämuuronen 2003). To answer the sub research question on (2) what are the differences in experiences between different countries and geographical areas regarding the added value creation the answers to different topics were compared with peoples' location.

The other sub research question aims at clarifying (3) what are the benefits and weaknesses of the SustainX tool defined by the tool users. According to Metsämuuronen (2003), questions meant for analysing attitude are often made to resemble interval scale. Commonly used measurement type is the Likert scale, which has 5, 7 or 9 answer options. A five-step Likert scale was used in the questionnaire for studying the benefits and weaknesses of using SustainX tool (appendix 1). Even though the idea of having uneven number of options is to force the respondent to have an opinion quite often the neutral alternative is placed in the middle, which provides the opportunity of not having an opinion after all (Valli, 2017). Indeed, one of the weaknesses of using Likert scale is to have people that have a tendency to use middle alternatives (Valli, 2017.)

Using a variety of different measurement scales enables analysing results in multiple methods. This study utilises several statistical analysis methods varying from cross tabulation, Chi square, Fisher's exact test, correlation and frequencies to statistical key numbers such as mean (Metsämuuronen, 2003). Also charts and percentages were used for demonstrating the results.

As presented earlier, the main research question about (1) whether and where the SustainX tool creates added value for StickyX's business was studied by analysing the added value potential in different end-use areas and company types. The survey (appendix 1) was asking respondents to evaluate the added value potential in the mentioned different environments.

The value of SustainX tool clearly varied between different end-use areas. Because of the differences the high potential end-use areas were chosen for further analysis. Those high-potential end-use areas were analysed in more detail to find out reasons behind the higher added value potential for business. It was analysed by using cross tabulation, correlation calculation and charts whether respondents' capabilities, role and own geographical location can affect the results.

The study provided information also on whether and in which company types the SustainX can create added value. The results were analysed by clarifying whether the results are affected by the knowledge level, organisational role or region. This was done by using cross tabulation, correlation calculation and comparing expected frequencies against actual frequencies.

The first sub research question aims at clarifying (2) what are the differences in the experiences between different countries and geographical areas regarding the added value creation of the SustainX tool. As the impact of the geographical location was used as an attribute in several earlier analyses the already existing information was utilised in the analysis together with a hypothesis that knowledge level has an impact to the defined added value potential. The relationship between the knowledge level and region was analysed with cross tabulation to clarify whether the knowledge level can affect the defined added value potential.

The second sub research question about (3) what are the benefits and weaknesses of the SustainX tool defined by the tool users was analysed by using a five-step Likert scale. The answers were transformed into statistical key figures for the data analysis. The key figures used were mean and standard deviation. In order to ensure the data validity also percentage data was utilised in the analysis.

However before the deeper data analysis for providing answers to the research questions it was also clarified that the coverage of the survey was sufficient regarding number of respondents, sex, age, location and job role. In addition, it was analysed who are using the SustainX tool and how is it normally used.

7 VALUE CREATION THROUGH SUSTAINX TOOL?

7.1 Coverage

The survey was sent to 236 StickyX business and sales people from whom 170 answered. That equals to 72%, which is reasonably high response rate and should sufficiently represent the coverage from the sample. From the respondents 36% were customer service, 46% sales and 18% business, which equals to organization division between the sample (figure 2). Therefore it can be concluded that the coverage is sufficient from organisation perspective.

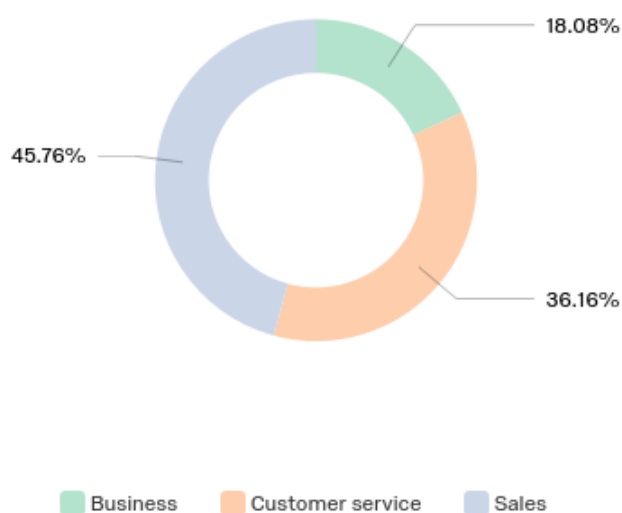


FIGURE 2. Questionnaire respondents by organisation.

To make sure the regional coverage was also sufficient the respondents were analysed by their responsibility area. 8% stated that they do not have their own responsibility area and 6% stated their responsibility area was not mentioned. Those 6% represented people from Middle-East, India or Africa that were excluded from the study. There were 45 different countries listed covering whole European market and as can be seen from figure 3, the seven biggest StickyX markets were visible also from the number of respondents.

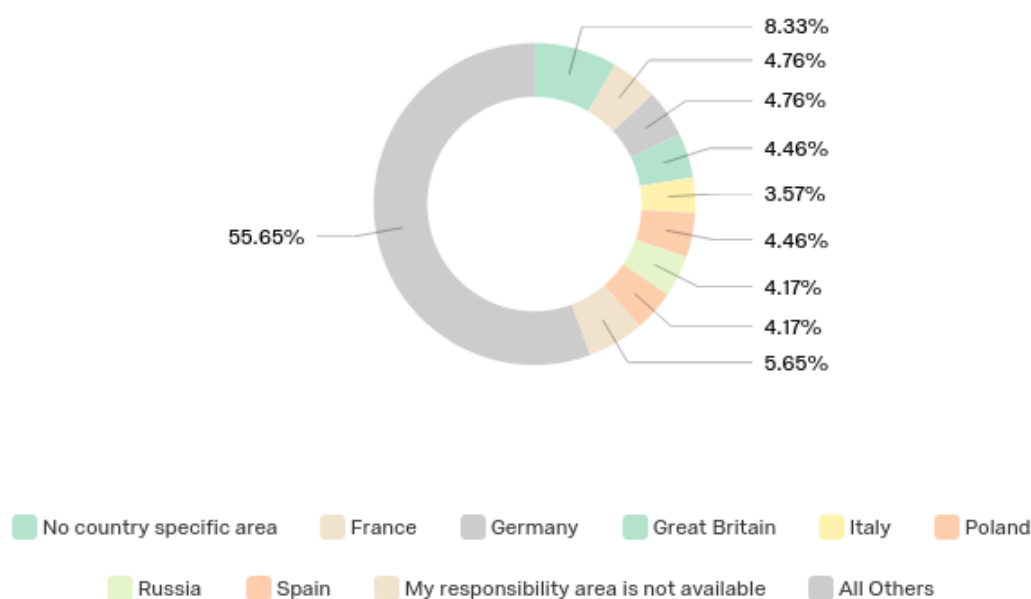


FIGURE 3. Respondents by countries. Biggest countries presented with percentages and smaller countries grouped under all others.

7.2 Users

As presented earlier SustainX tool is a LCA-based consultancy tool that StickyX uses for analysing the environmental impacts of their products. The tool is web-based and available in company network. The tool was built to be used together with the customers and brand owners by sales organisation and also to support business people for getting product level information and sharing the knowledge with their stakeholders. The questionnaire (appendix 1) clarifies what is the common way of working in reality, what are the benefits and weaknesses and in which areas there is added value creation potential.

First, it was clarified who are using the SustainX tool. This was analysed by using attributes such as gender, organisational position, age and geographical area. It turned out that gender does not affect to the use of SustainX tool even though men are more active users (table 1). Fisher's exact test can be used for finding out whether there is a significant relationship between different factors. That is described with p-value, which is generally considered to be a figure less than .05 to prove the relationship. (Metsämuuronen, 2003, 297-298)

P-value as an outcome of the Fisher's exact test tells that there is a significant relationship between the gender and the usage of the SustainX tool ($p < 0,001$). The more active use by men could be explained by coincidence or by organisational attributes. To test that further the cross tabulation was continued by adding a banner about the organisation. As table 1 presents there is a significant difference in the usage between different organisations (p-value $< 0,001$ by Chi-Square test). The table 1 shows that customer service does not use the tool actively but sales does and is in fact the most active user group. It also becomes clear from the results that business organisation is not active SustainX tool user.

To conclude sales organisation is the most active user, which is natural based on the job description and the planned functionality of the SustainX tool.

	Gender			Organisational role				
	Male	Female	Total	Business	Customer service	Sales	Total	
Tool usage	Yes	48	31	79	10	17	54	81
	No	20	37	57	13	30	12	55
Total	68	68	136	23	47	66	136	

Tool usage		Gender	Organisational role
	Chi Square	8.73	26.72
	Degrees of Freedom	1	2
p-value	0.00	0.00	

TABLE 1. Analysis about gender and job role affecting the use of the SustainX tool.

The next attribute to be analysed is age. However, based on the results presented in table 2 we can conclude that there is no relationship between age and the use of SustainX tool (p-value being 0,24 and thus above generally used 0,05 limit).

		How old are you?						Total
		24 or younger	25-34	35-44	45-54	55-64	64 or older	
Have you used the SustainX tool?	Yes	0	12	32	32	5	0	81
	No	1	16	17	22	1	0	57
Total		1	28	49	54	6	0	138

Have you used the SustainX tool?		How old are you?
	Chi Square	6.71*
	Degrees of Freedom	5
p-value	0.24	

TABLE 2. Analysis about age affecting the use of the SustainX tool.

The questionnaire participants represented 45 countries and therefore the result data was simplified at the beginning to ease the analysis. Countries were divided into four market regions being Northern Europe, Central Europe, Eastern Europe and Southern Europe. As can be seen from figure 4 the user rate of the SustainX tool in Northern Europe is relatively high in all countries with one exception being Norway. In most countries the user rate is between 50 and 92 percent with one outlier value being 100% and representing Faroe Islands from which there was only one respondent.

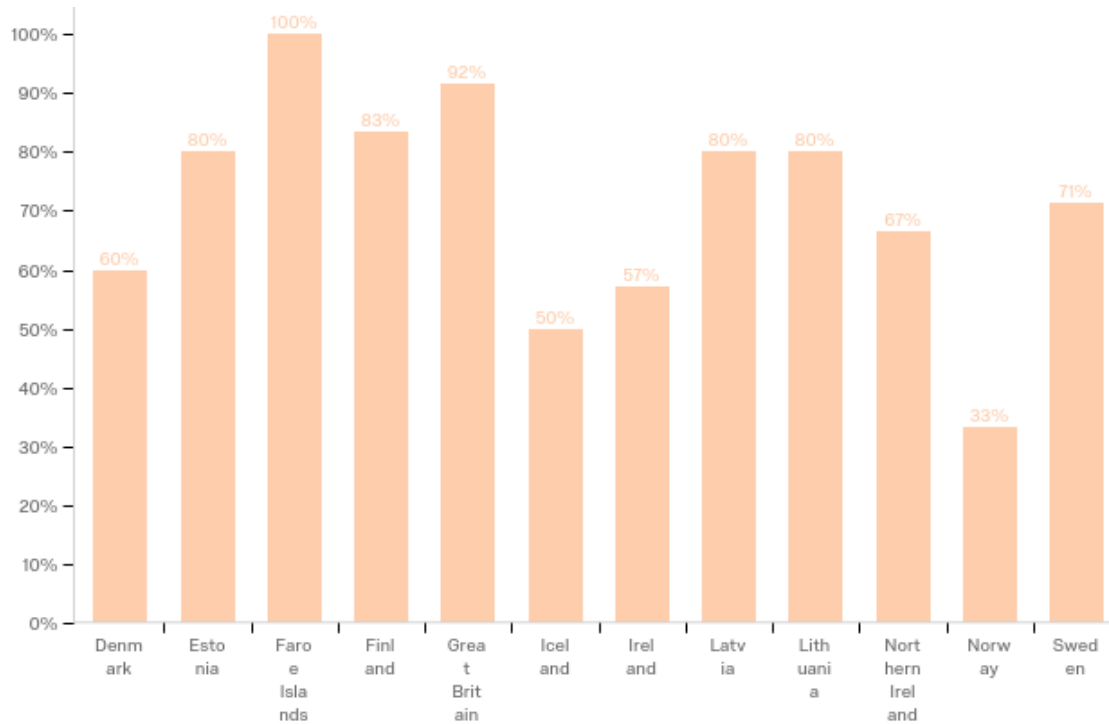


FIGURE 4. SustainX use in Northern Europe market region.

In Central Europe, the user rate is clearly lower varying from 25% to 67% as can be seen from figure 5. There is also less variation between different countries if compared to Northern Europe data. However, it is also good to acknowledge that some of the countries like Austria might have only some respondents whereas in Poland the answering organisation is much wider.

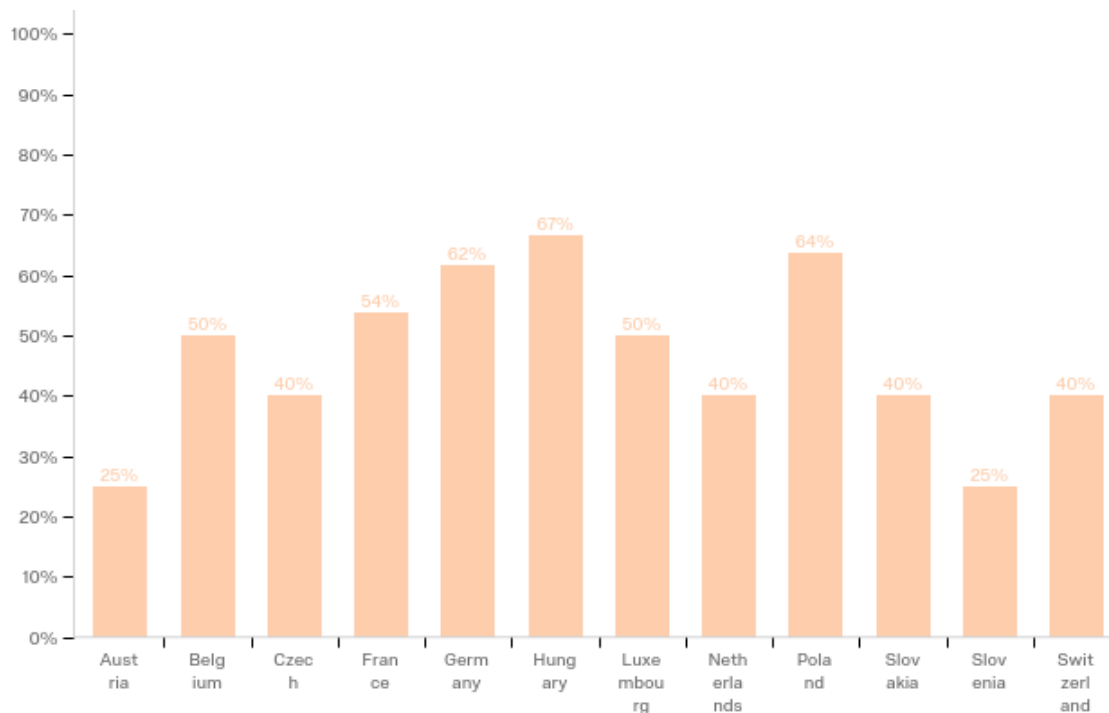


FIGURE 5. SustainX use in Central Europe market region.

Most countries in Eastern Europe have user rate between 33% and 75% (figure 6). However, in Russia the user rate is 17%, which represents the lowest score and is an outlier in the Eastern Europe market region. It can be questioned what is the reason behind. Here it is also good to acknowledge that some of the countries have one- or two-man organisation, which might affect the results.

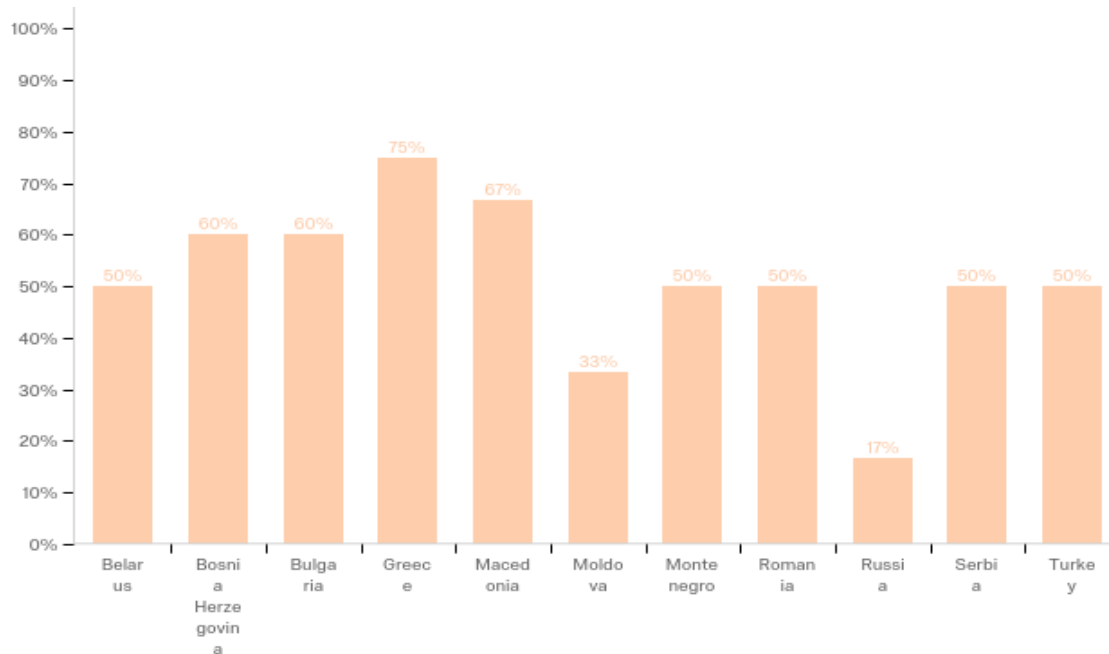


FIGURE 6. SustainX use in Eastern Europe market region.

Southern Europe includes clearly less countries than other regions but nevertheless it can be said that in Southern Europe the usage of SustainX tool is something between the activity in Northern Europe and Central Europe (figure 7). However, two of the countries (Andorra and San Marino) had only one respondent, which has affects the results of Southern Europe activity data.

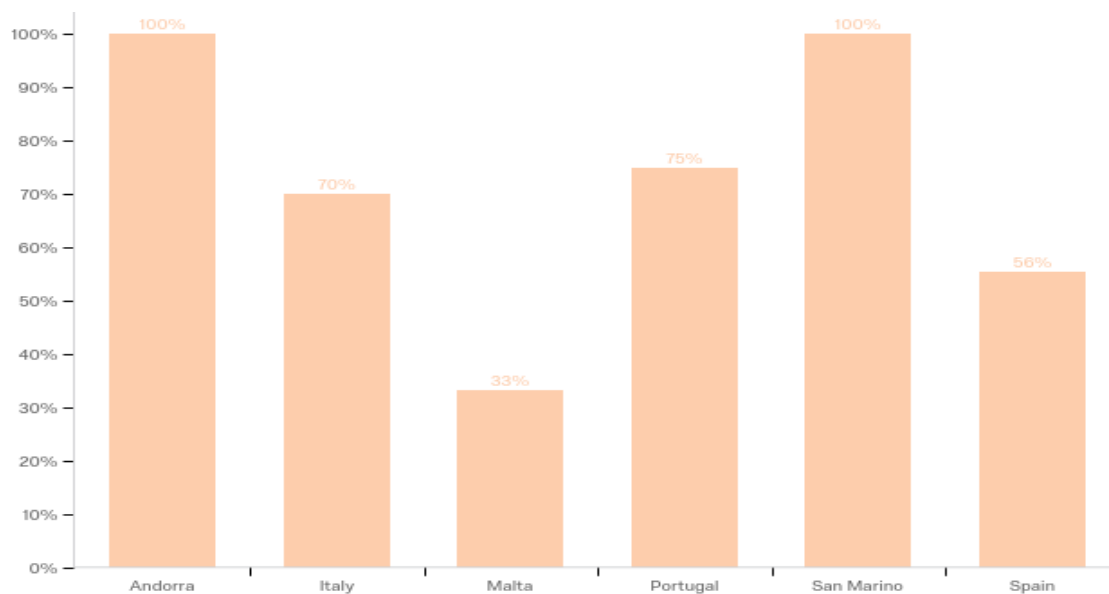


FIGURE 7. SustainX use in Southern Europe market region.

7.3 Tool in use

This chapter will describe how SustainX tool is being used. The user activity was studied by asking how often the tool is being used by the respondent (figure 8). It became clear that the tool is not used actively and there was no single answer about weekly or bi-weekly usage. 40% of the respondents answered using 1-2 times a year and only 14% stated using 1-2 times a month. Based on the results (figure 8) it could be questioned what is the reason behind; is it about lack of knowledge regarding the topic, lack of interest or about unsuccessful marketing of the tool's existence.

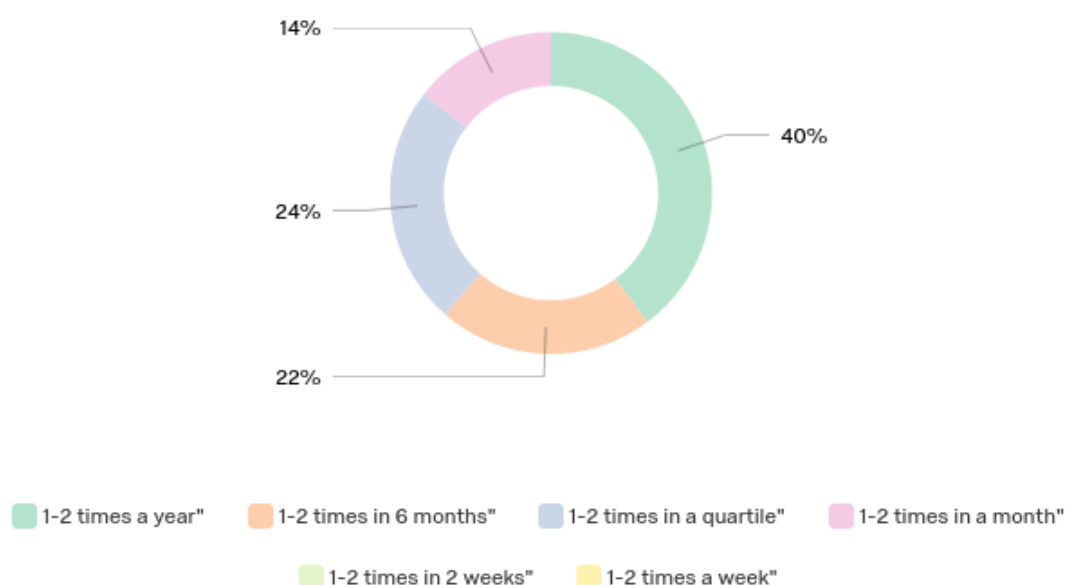


FIGURE 8. User activity.

When asked what is the typical audience it was clear that local customers are the most popular audience with 63% (figure 9). The secondly common answer was multinational customer with 21%. The results are quite logical if looking the wider picture and keeping in mind the decision-making structure of the self-adhesive labeling industry. As explained previously in chapter 5.2, the brand owners make the decisions and push those through printers to self-adhesive labelstock producers. The communication between self-adhesive labelstock producers like StickyX and brand owners is often quite invisible. Therefore also the SustainX tool is understandably more presented to direct customers even though the brand owners might be the ones who have higher interest to sustainability topics.

From the results (figure 9) you can also see the difference between local and multinational brand owners when it comes to utilizing LCA results. This can be the outcome of having more connections with multinational brand owners or demonstrate the different level of importance of sustainability topics between local and multinationals.

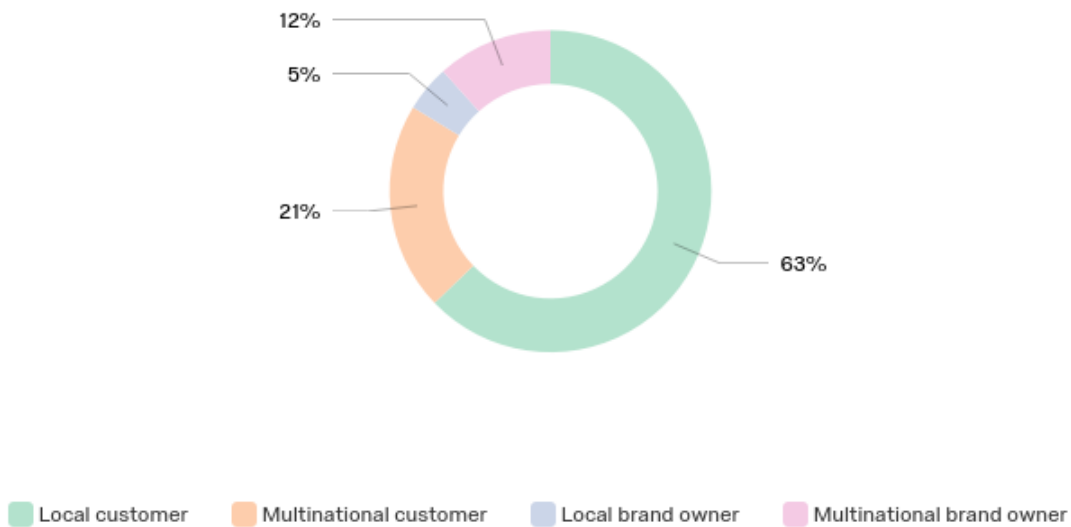


FIGURE 9. Audience regarding SustainX tool results.

When studying how the tool is used in reality it turned out that people are using the tool quite differently. Some are using it without any further comparisons whereas others always continue their analysis further (figure 10). Respondents stated that they often make one product comparison and maybe also adjust the end-of-life scenario for comparison. They rarely use the functionality of calculating results only for one product but simultaneously they do not make several product comparisons either. To summarize the most typical way of using the tool is to take one product comparison and potentially adjust some of the factors. Some also admit only opening the front page, which probably refers to showing the tool to someone for example in a business meeting.

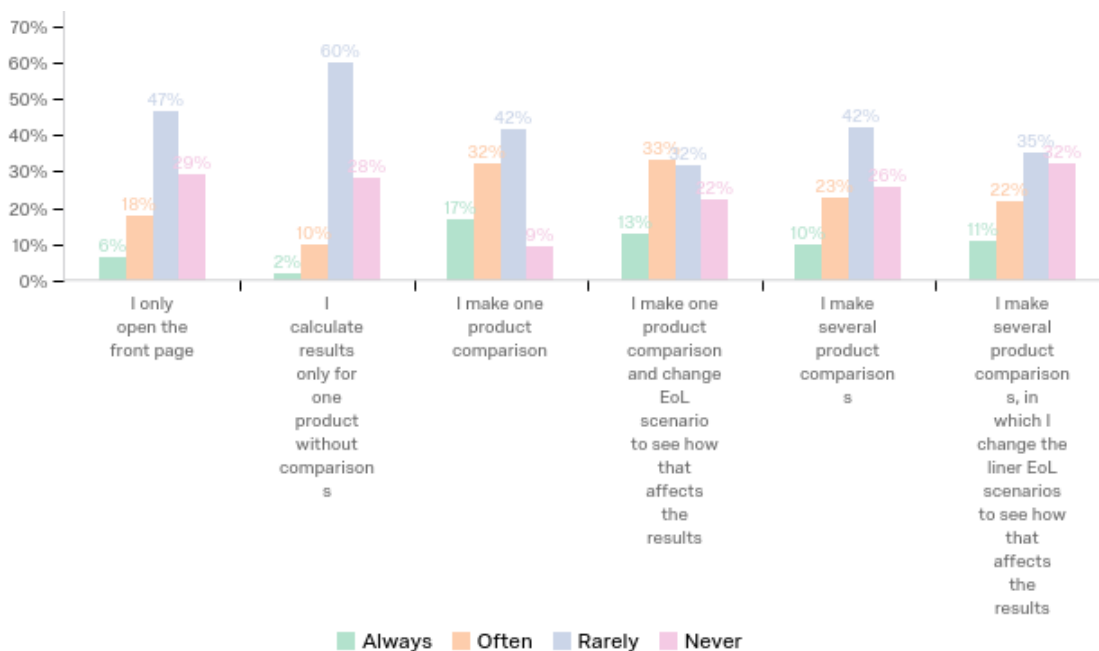


FIGURE 10. Typical way of using SustainX tool.

The SustainX tool was built to help sales organization to engage with their customers. The tool was designed in a way that it can be used for getting results as PDF files but also for using the tool together with customers or even brand owners. When the actual using method was asked it became clear that 40% of respondents often use the results for their presentations (figure 11). In other words the results are used for marketing purposes. As presented by several authors (Branco & Rodrigues, 2006; Buxel et al., 2015), the LCA results can be used for differentiating products to increase customer value. Based on the results (figure 11), as much as 67% state that they are rarely or never using the tool together with their customers or brand owners. When asked about sending results in a PDF format 66% stated that they do it rarely or never. Most respondents (46%) stated that they rarely use the tool for gaining knowledge but simultaneously 39% of the respondents said doing that always or often.

As a really high lever analysis it could be concluded that SustainX tool results are mostly used in presentations, not so often sent forward as PDF files and using the tool together with external parties is quite rare.

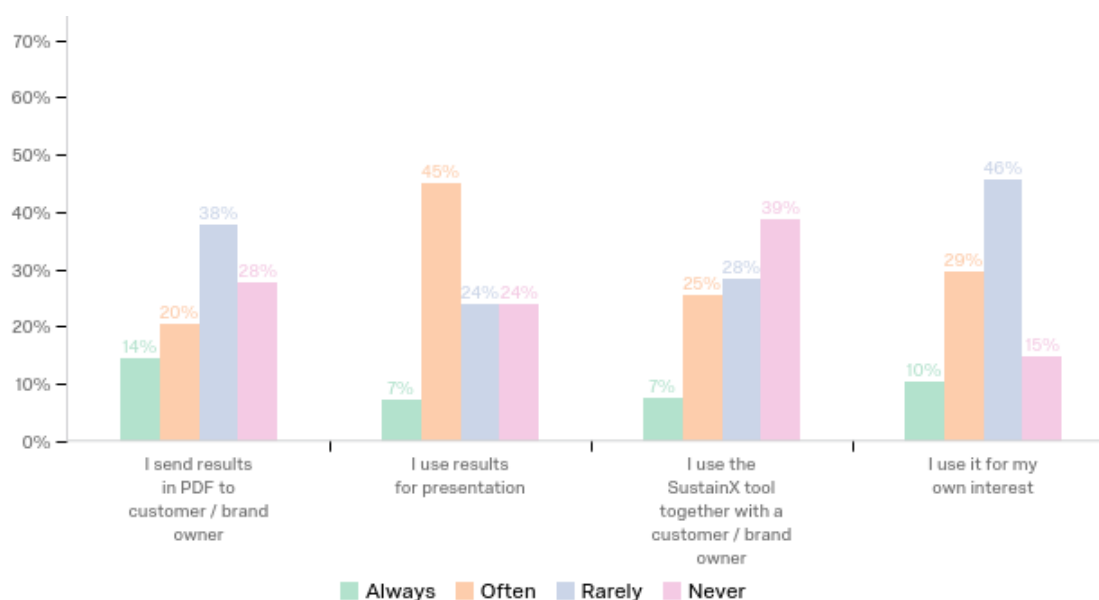


FIGURE 11. Typical way of using SustainX tool results.

7.4 Benefits and weaknesses

This chapter will answer the sub-question of the study on (3) what are the benefits and the weaknesses of the SustainX tool defined by the users. A 5-point Likert scale was used to study the weaknesses and benefits of using SustainX tool. According to Metsämuuronen (2003), Likert scale is used for measuring intrinsic subjective feelings. Even though Likert scale represents ordinal scale it is generally seen as interval scale (Metsämuuronen, 2003). Thus, the analysis was done by using mean and standard deviation. Those can provide a general picture but it is also good to utilize the percent data to ensure the data validity. For

example, if half of the respondents gave value 1 and half value 5 the mean would be 3 but might not tell the whole story if used independently.

There were six items in a question and a 5-point scale to study the benefits of the SustainX tool. The scale was created as the following to transform into numbers: strongly agree (1), somewhat agree (2), neither agree nor disagree (3), somewhat disagree (4), strongly disagree (5). As table 3 presents, mean was clearly on the other side of the scale and varied between 1,42 and 1,99 supporting the claims. Moreover, also the standard deviation, which stands for the amount of variation of a set of data, was consistently relatively small varying between 0,63 and 0,89. When looking at figure 12 it can be noticed that the respondents have agreed on the first item the most with one outlier value stating strongly disagree. That however, can also be a human error.

The strongest agreeing was related to LCA supporting the brand image. As explained earlier LCA can help making strategic decisions on products lines and marketing programs and defining risks and opportunities (Kotler et al. 2013; Buxel et al., 2015). Competitive advantage through the tool got the lowest mean (table 3) but on the other hand the result is still high and 35% strongly agreed and 36% somewhat agreed (figure 12). The standard deviation was highest in this item meaning that the responses are more scattered than in other items. It might be important to notice that as many as 23% stated neither to agree nor disagree. In other words there were several respondents who did not see the SustainX tool as competitive advantage but they are also the potential group for growing the competitive advantage thinking. The question however is that would training change the views or some success stories by other users?

Another interesting detail in the results is related to engaging with customers and brand owners. As can be seen from figure 12, there are 58% that somewhat agree and 34% that strongly agree with the claim of SustainX tool helping to engage with customers and brand owners. This group of 58% is a relevant finding if thinking the main purpose of the LCA consultancy tool. The tool was built to help the sales organisation to engage with their customers and also brand owners but so far there are more people that somewhat agree than those who strongly agree (figure 12).

As presented earlier in chapter 4.5 and 4.7 the LCA can also be used as a “door-opening” aspect to bring value in regards of marketing and sales. The LCA results used for product marketing could lead into further conversations around sustainability challenges between companies and even to joint development projects (Buxel et al., 2015). That again could strengthen business relationship and lead into growing business opportunities. As this was the main purpose of creating the SustainX tool it is valuable to see that even though one third already agrees with the benefits created there is relatively large group of people (58%) that still do not strongly agree. This gives the opportunity for internal marketing and best practise info sharing. It would be also beneficial to interview some study respondents to find out why the value of the tool has not yet been totally captured. Are there some weaknesses in the tool itself, is it about lack of resources to get truly familiar with its capabilities or what is the reason behind?

#	Field	Mean	Std Deviation	Count
1	I learn more about the environmental impacts of products	1.53	0.69	77
2	I can promote our products as sustainable options	1.49	0.68	77
3	Results support our sales messages (e.g. FIT range, RX15)	1.75	0.84	77
4	It helps engaging with customers / brand owners	1.75	0.63	77
5	It supports our BioFore company brand image	1.42	0.63	77
6	It is our competitive advantage	1.99	0.89	77

TABLE 3. Benefits of using the SustainX tool in statistical numbers.

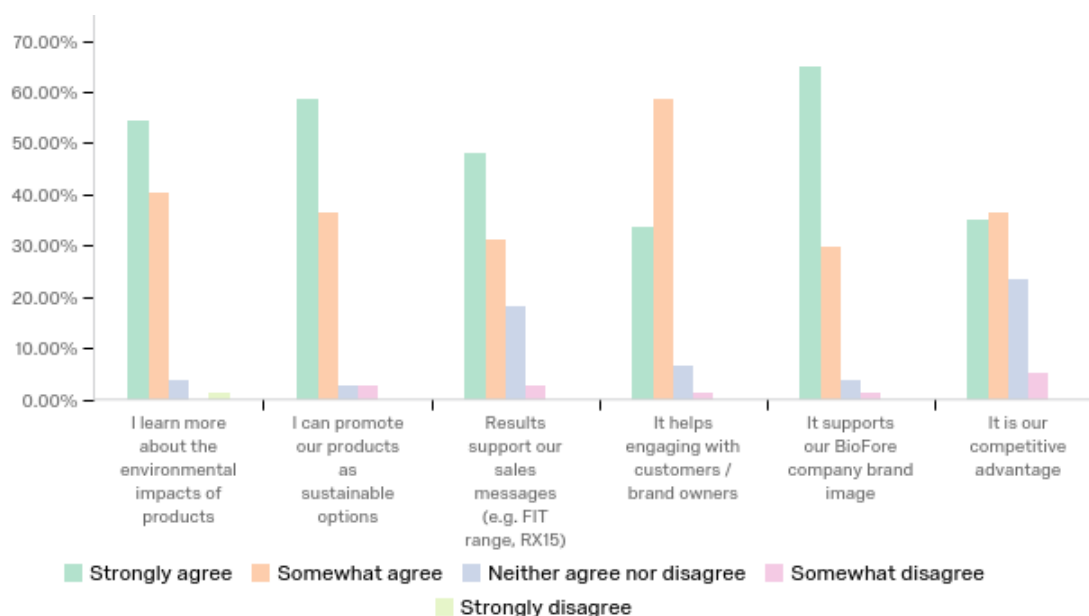


FIGURE 12. Benefits of using the SustainX tool.

Similar 5-point Likert scale was also used for analyzing the weaknesses of the SustainX tool. There were seven items in a question and a 5-point scale. The scale was transformed into numbers as above: strongly agree (1), somewhat agree (2), neither agree nor disagree (3), somewhat disagree (4), strongly disagree (5). As table 4 presents, mean varies between 2,24 and 4,17 and the standard deviation is higher than in the previous analysis being 0,87-0,98. As smaller mean stands for agreement and bigger disagreement it can be concluded that

respondents disagree with the claim that there would be no value in the tool (mean 4,17 and standard deviation 0,87 being the lowest in table 4).

When looking the percentages from figure 13, there are two findings to be made. First of all, three items have gained the highest level of agreement. Item 2 (printer interest to environmental impacts) and 4 (internal vs. external version) have highest single bars (51% and 43%) that indicate about stronger opinion. Item 7 (supports more PaBu [paper business] than FSB [films and specials business]) has also a high bar (42%) for somewhat agree but at the same time almost as high for neither agree nor disagree (35%). It could be concluded that respondents somewhat agree that printers are not interested about environmental topics and the SustainX tool should be available also externally. The first finding is also in line with the results of PRÉ Consultants bv (2015, 19) who found out that only 14% of respondent companies in the labelling industry were utilising LCA. The study also revealed that from the companies not using LCA as many as 58% were not familiar with the method or its applications. For printers this number was 68%.

The second thing that can be highlighted from figure 13 is the distinguishably high bar of item 5 (product availability) and 6 (tailored calculations). 48% of respondents do not have a clear opinion whether they cannot find needed products and whether they would need more tailored LCA calculations. According to Metsämuuronen (2003), Likert scale measures simultaneously whether there is an opinion (answer scale 1, 2, 4 and 5 standing for yes and 3 standing for no) and the like-mindedness with the claim. Thus, choosing answer 3 (neither agree nor disagree) can either refer to not having an opinion or not being able to choose between agreeing and disagreeing.

#	Field	Mean	Std Deviation	Count
1	It is difficult to use	3.36	0.97	75
2	Printing houses are not interested about the environmental impacts	2.38	0.98	74
3	I don't see the value of the tool	4.17	0.87	75
4	Internal version is not enough - it should be available externally	2.24	0.94	76
5	I can't find the products that I would need for my purpose	3.10	0.98	73
6	I would need more tailored LCA calculations	2.77	0.96	73
7	It supports more PaBu than FSB	2.41	0.90	71

TABLE 4. Weaknesses of using the SustainX tool in statistical numbers.

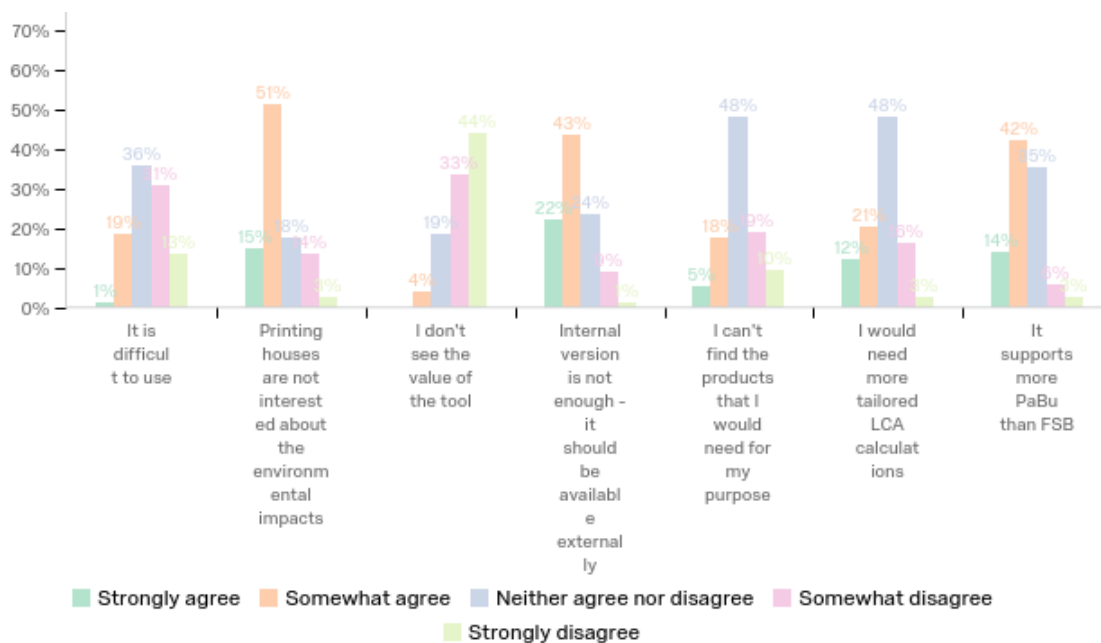


FIGURE 13. Weaknesses of using the SustainX tool.

7.5 Added value potential per end-use areas

The main question this study aims at answering is (1) whether and where SustainX tool creates added value for StickyX's business. One of the main study topics is the added value potential in different end-use areas. As presented earlier, StickyX business is divided into 14 end-use areas that have different technical and visual needs. For example, wine and spirits business requires visually more attractive materials than oil and industrial chemical labelling. Similarly, the needs of durable labelling about the adhesive self-life are much more demanding compared to food labelling.

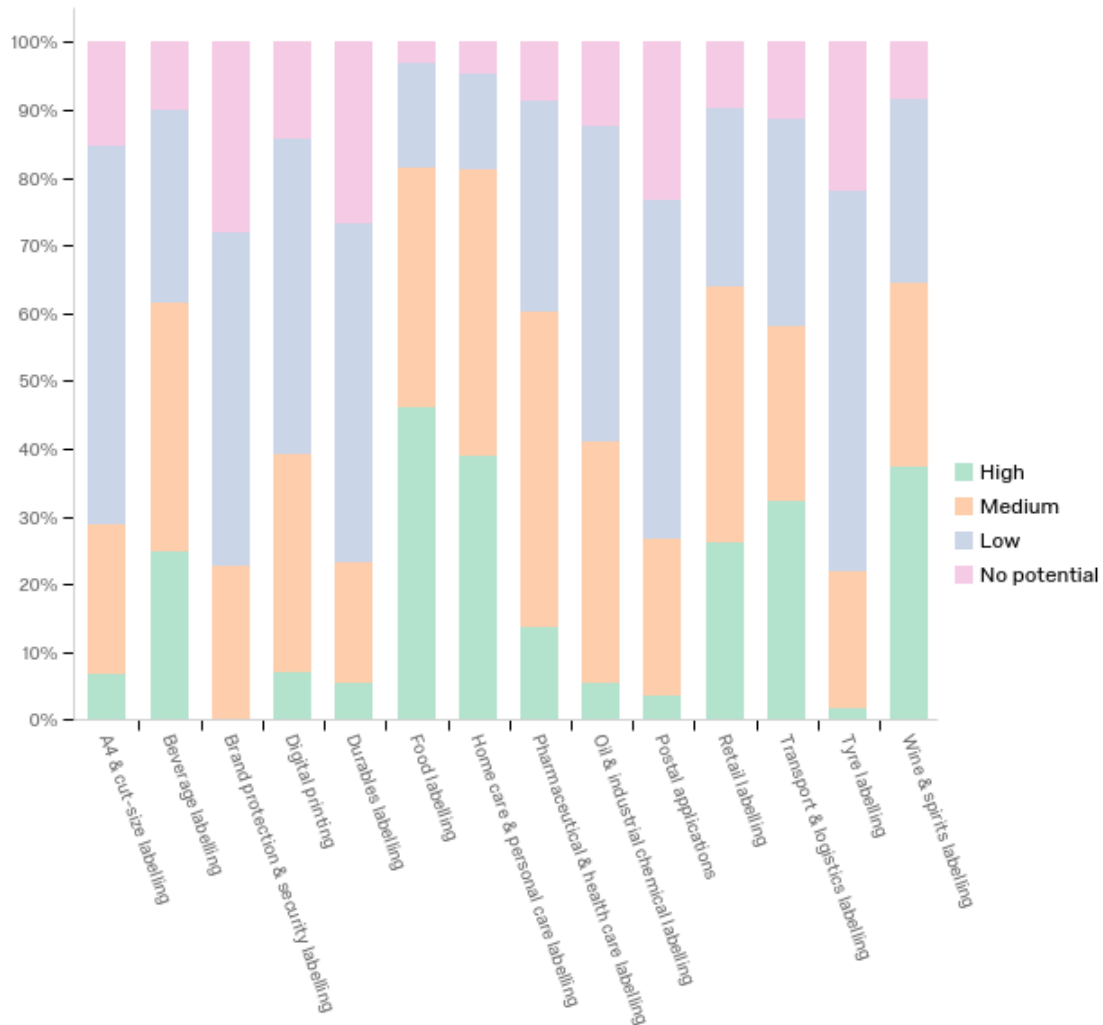


FIGURE 14. Added value potential per end-use area.

The respondents were asked to evaluate the added value potential of the SustainX tool in different end-use areas. As can be seen from figure 14, the highest potential was seen in food labelling (46%), home and personal care (39%) and wine and spirits labelling (37%). These will be called as high potential end-use areas. Also transport and logistics labelling (32%), retail labelling (26%) and

beverage labelling (25%) were relatively highly ranked. The rest of the end-use areas were clearly not seen as high potential opportunities (figure 14). The end-use areas where the SustainX tool was most highly ranked as having no potential were brand protection (28%), durables labelling (27%) and postal applications (23%).

Based on the results the high potential end-use areas were chosen for further analysis. This chapter aims at answering what were the reasons behind; how capabilities, role and own geographical location affect the results. First it was analysed whether the knowledge level about LCA affects the seen added value potential. This was done by using a cross tabulation that measures the relationship between two variables. Table 5 presents the results for each high potential end-use areas. As explained earlier, a p-value determines whether there is statistically significant association between the two variables (Metsämuuronen, 2003). When p-value is less than 0,05 the observed table relationship could occur with very low probability, which means that there would be significant relationship between variables. However, as the p-values are greater than 0,05 varying between 0,21 and 0,49 it can be stated that there is no relationship between knowledge level and added value potential (table 5).

		AV potential in food labelling					AV potential in home and personal care					AV potential in wine & spirits				
		High	Medium	Low	No potential	Total	High	Medium	Low	No potential	Total	High	Medium	Low	No potential	Total
Knowledge level	Weak knowledge	5	1	2	0	8	4	2	2	0	8	3	1	3	1	8
	Medium knowledge	10	13	8	1	32	7	17	5	2	31	9	7	11	3	30
	Strong knowledge	14	9	0	1	24	13	8	1	1	23	9	8	2	1	20
	No relevant answer	1	0	0	0	1	1	0	1	0	2	1	0	0	0	1
Total		30	23	10	2	65	25	27	9	3	64	22	16	16	5	59

		AV potential in food labelling	AV potential in home and personal care	AV potential in wine & spirits
		Knowledge level	Chi Square	11.84*
	Degrees of Freedom	9	9	9
	p-value	0.22	0.21	0.49

TABLE 5. Analysis about the relationship between knowledge level and added value potential in food labelling, home and personal care and wine and spirits.

To test the relationship further this was also studied by utilising correlation calculation. Correlation coefficient, r , describes the connection between two quantitative variables by strength and direction of linear relationship. Correlation coefficient always has a value between -1 and 1. Values closest to zero are weak and values closest to -1 and 1 are the strongest. Plus or minus sign indicates the positive or negative direction of the relationship. Generally correlation coefficient between 0,8 and 1 is extremely high, between 0,6 and 0,8 high and between 0,4 and 0,6 relatively high. (Metsämuuronen, 2003).

For example, for food labelling r is 0,17, which means that there is a small positive correlation between knowledge level and seeing added value potential in food labelling. The quality of the calculated r can be evaluated by us-

ing coefficient of determination, r^2 , which tells how much the variables can explain of each other (Metsämuuronen, 2003). When r is 0,17, r^2 is 0,03 meaning that variables can only explain 3% of each other and 97% cannot be explained. Thus the correlation coefficient is not significant. According to Metsämuuronen (2003), the significance of correlation coefficient is dependent on correlation and sample size. If sample size is small neither a big correlation is statistically significant.

Even though according to statistical testing there is no relationship or only weak relationship between knowledge and added value potential the cross tabulation provides more insights. As can be seen from table 5, the high added value potential seems to have positive correlation with the knowledge level in food and home and personal care labelling. This, however, might be random occurrence and cannot be used for further generalisation.

Secondly the impact of organisational role was analysed to find out whether the views of sales, customer service and business vary regarding the added value potential of the SustainX tool in different end-use areas. The analysis was made by using a cross tabulation method. As can be seen from table 6, there is no significant relationship between the role of the respondent and the added value seen in using the SustainX tool as the p-values vary between 0,11 and 0,37. However, if compared the actual frequencies against the expected frequencies, which are coloured with purple, there are some findings to be made. Based on the results (table 6) business organisation grades the added value potential of the SustainX tool higher than the expected frequency suggested. Thus it can be concluded that at least when it comes to seeing high added value potential the business organisation is more positive than sales and customer service organisation.

		AV potential in food labeling				AV potential in home and personal care				AV potential in wine and spirits				Total		
		High	Medium	Low	No potential	High	Medium	Low	No potential	High	Medium	Low	No potential			
Role	Business	5 2.19	1 -1.06	0 -0.94	0 -0.19	6	5 2.66	1 -1.53	0 -0.84	0 -0.28	6	4 2.51	0 -1.08	0 -1.08	0 -0.34	4
	Customer service	5 -1.09	4 -0.47	4 1.97	0 -0.41	13	4 -1.08	5 -0.48	4 2.17	0 -0.61	13	3 -1.85	5 1.47	5 1.47	0 -1.10	13
	Sales	20 -1.09	17 1.53	6 -1.03	2 0.59	45	16 -1.58	21 2.02	5 -1.33	3 0.89	45	15 -0.66	11 -0.39	11 -0.39	5 1.44	42
Total		30	22	10	2	64	25	27	9	3	64	22	16	16	5	59

		AV potential in food labeling	AV potential in home and personal care	AV potential in wine and spirits
Role	Chi Square	6.54*	9.53*	10.40*
	Degrees of Freedom	6	6	6
	p-value	0.37	0.15	0.11

TABLE 6. Analysis about the relationship between role and added value potential in food labelling, home and personal care and wine and spirits.

Another finding is related to seeing no potential. The actual frequency is clearly higher than the expected frequency for the sales seeing no added value potential in wine and spirits end-use area. This might be explained with one of the weaknesses related to data and product availability but raises interest for further analysis because wine and spirits end-use area has traditionally been actively using the SustainX tool.

The third topic for analysis was the relationship between the respondents' geographical location and the defined added value potential. This was studied by using charts to describe the situation for the chosen high potential end-use areas. As can be seen from figure 15, the highest potential of using the SustainX tool was seen in Northern Europe (60%) for food end-use area. Also in Southern and Central Europe 33% of the respondents graded the potential as high. In the Eastern Europe 57% graded added value potential as medium but also 14% stated that there is no potential. To summarize it can be said that for food labeling the highest potential of using the SustainX tool is being seen in Northern Europe and the least in Eastern Europe (figure 15).

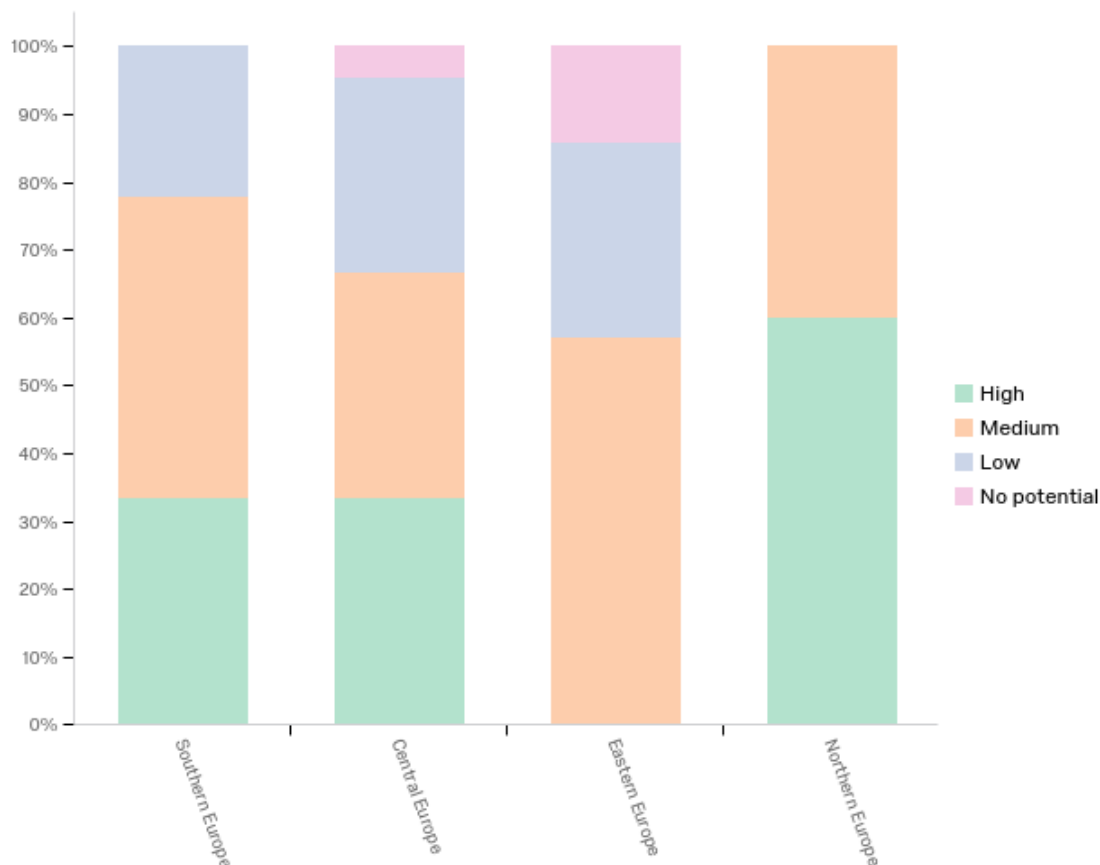


FIGURE 15. Added value potential in food end-use area per region.

Similarly, in home and personal care end-use area the highest potential was seen in Northern Europe with 46% of the respondents grading high and the rest 54% as medium (figure 16). Again, in Southern and Central Europe the high added value potential was stated by 33% of the respondents. In Eastern Europe 57% of the respondents graded the added value potential as medium and 14%

as having no potential. The regional differences in seeing added value potential is almost identical between food and home and personal care end-use areas as can be seen from figure 15 and figure 16.

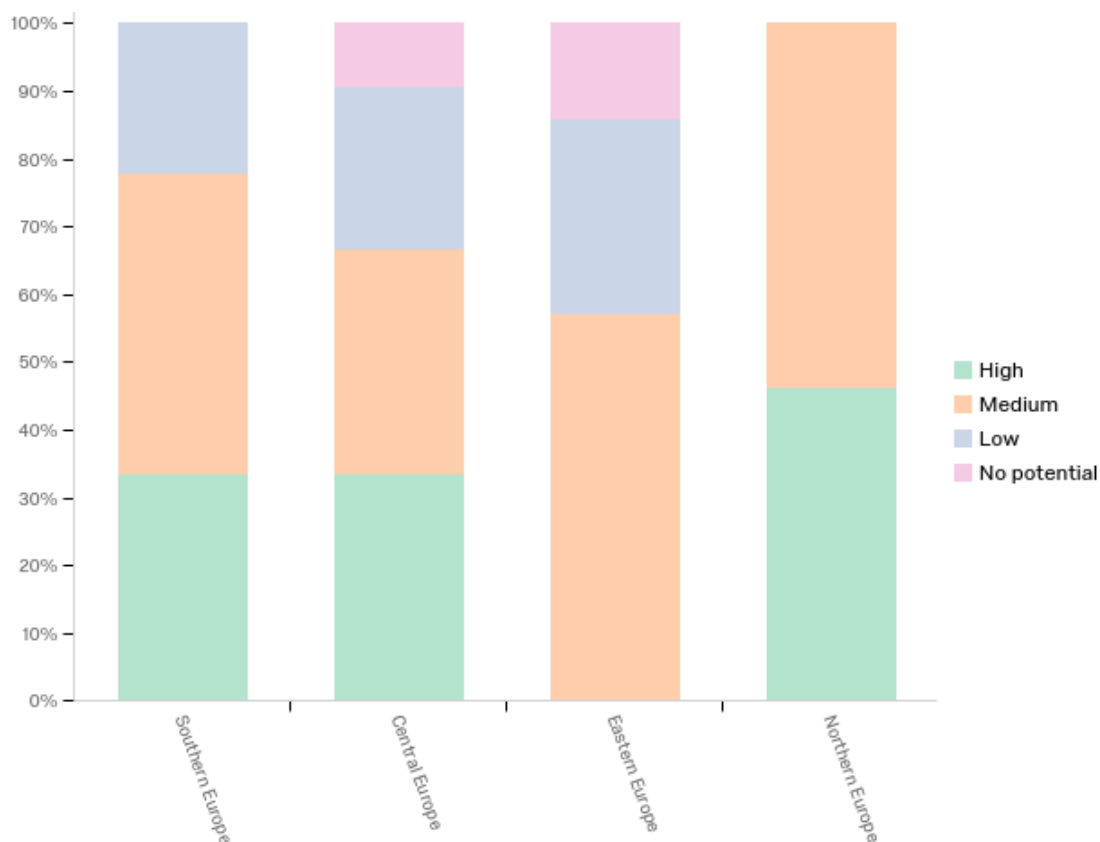


FIGURE 16. Added value potential in home and personal care end-use area per region.

For the wine and spirits end-use area the results are quite different compared to other analysed high potential end-use areas (figure 17). Northern Europe sees the biggest value as 43% of the respondents stating high and 50% medium. Again Eastern Europe represents the region where the attitude is the most negative. However, in Eastern Europe for wine and spirits there are also 14% grading the added value potential as high and 14% as medium whereas most of the respondents (43%) see only low potential and 29% no potential (figure 17).

If compared to food and home and personal care end-use areas the high added value seen in Southern Europe is clearly higher. However, what is also interesting is that for both Southern and Central Europe there is relatively big group of respondents seeing high value and simultaneously low value but smaller group seeing medium value (figure 17). It could be further studied whether this could be explained by organisational differences meaning that is there a group of people who are working closely with this end-use area and therefore see high potential whereas rest of the people who are not that specified to wine and spirits end-use see only low added value at using the SustainX tool.

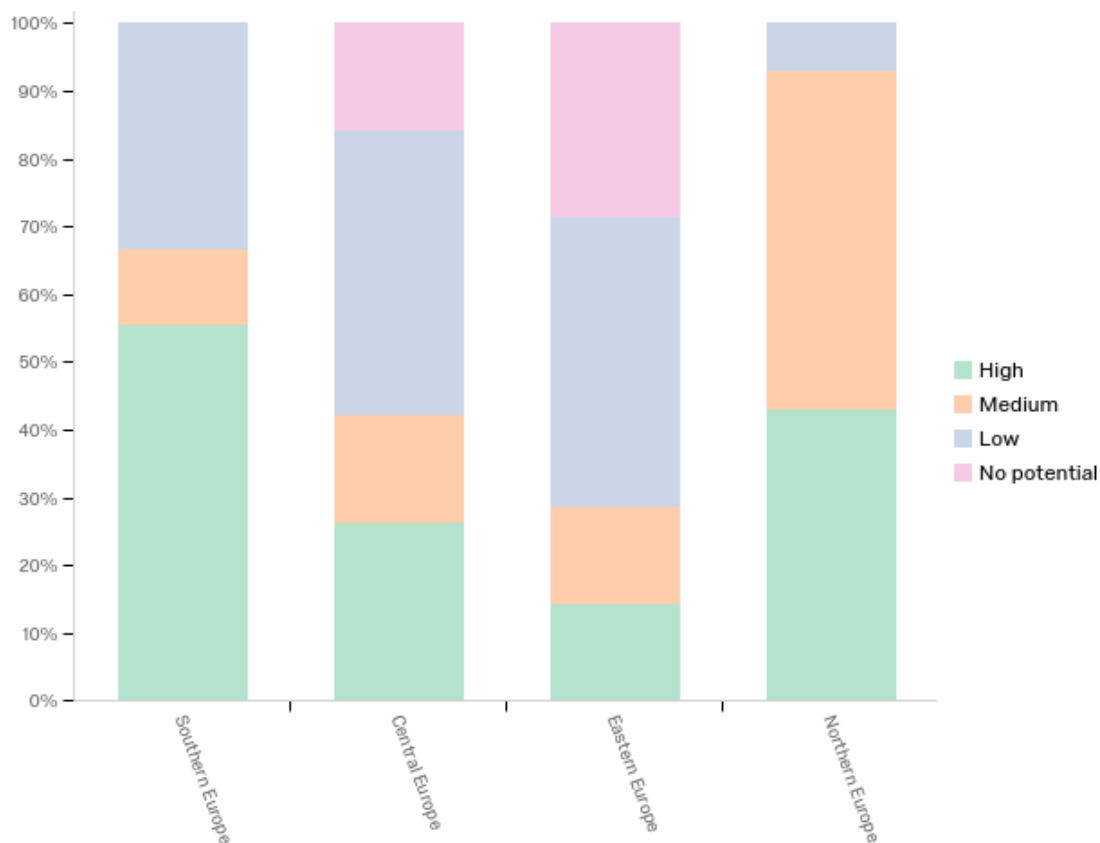


FIGURE 17. Added value potential in wine and spirits end-use area per region.

7.6 Added value potential per company types

The main question this study aims at answering is (1) whether and where SustainX tool creates added value to StickyX's business. One of the main study topics is the added value potential in different company types. The companies are split into four categories being local customer, multinational customer, local brand owner and multinational brand owner. It could be said that typically customers, in other terms printers, are local small family-owned companies because there are less than five multinational printing companies globally. In terms of sustainability global brand owners are frontrunners in setting sustainability goals and having those as part of their purchasing decisions whereas local brand owners are not expected to be that interested about sustainability and more precisely from LCA.

As expected the highest added value potential 62% is seen with multinational brand owners (figure 18). The potential with local customers is ranked the lowest with 53% of the respondents grading it as low and 10% seeing no potential. To study this further this chapter will present whether the results are affected by the knowledge level, organisational role or region.

First it was analysed whether there is relationship between the knowledge level and the added value potential seen in different company types. This was done by using cross tabulation. The results are presented in table 7. As

can be seen from table 7, there is no significant relationship between the knowledge level and the added value potential in different company types as the p-value is greater than 0,05.

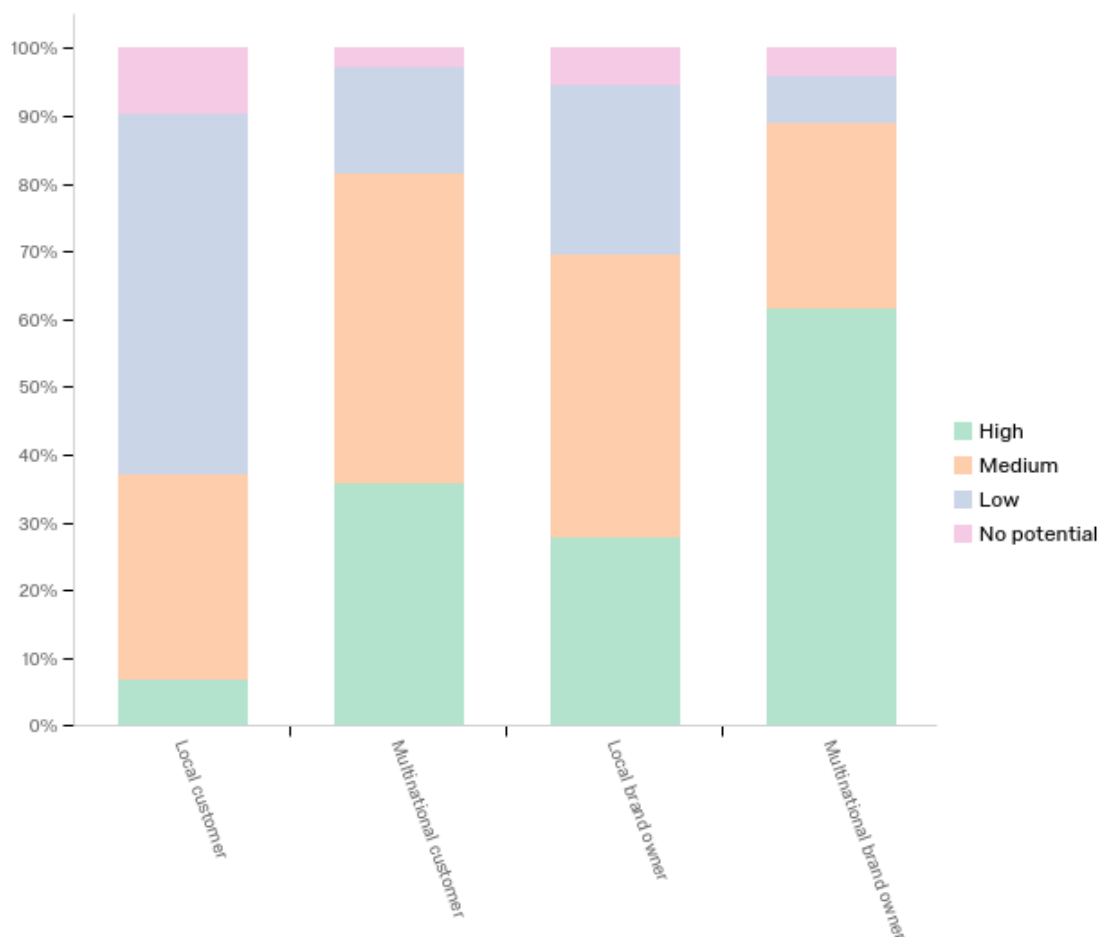


FIGURE 18. Added value potential per company type.

	AV potential - local customer					AV potential - multinational customer					AV potential - local brand owner					AV potential - multinational brand owner					
	High	Medium	Low	No potential	Total	High	Medium	Low	No potential	Total	High	Medium	Low	No potential	Total	High	Medium	Low	No potential	Total	
Knowledge level	Weak	3	1	4	2	10	6	2	3	0	11	4	2	5	0	11	6	4	1	0	11
	Medium	1	9	20	4	34	10	14	7	1	32	6	13	10	3	32	19	10	2	2	33
	Strong	1	12	14	1	28	9	15	1	1	26	10	14	3	1	28	20	5	1	1	27
	N/A	0	0	1	0	1	0	1	0	0	1	0	1	0	0	1	0	1	1	0	2
Total	5	22	39	7	73	25	32	11	2	70	20	30	18	4	72	45	20	5	3	73	

Knowledge level	Chi Square	15.83*	9.58*	11.47*	10.45*
	Degrees of Freedom	9	9	9	9
	p-value	0.07	0.39	0.24	0.32

TABLE 7. Analysis about the relationship between knowledge level and added value potential for different company types.

To prove this analysis also correlation calculation was used. As explained earlier, correlation coefficient, r , describes the connection between two variables and has always a value between -1 and 1 (Metsämuuronen, 2003). The correlation coefficient between the knowledge level and the different companies varied between 0,02 and 0,17. In other words for each case the correlation coefficient represented weak correlation. It can be concluded that the knowledge level is not affecting the added value potential defined in different company types.

Secondly it was studied whether the organisational role has a link to the added value potential seen in different company types. This was analysed by using a cross tabulation method. As table 8 presents there is variation in the added value potential seen between different organisational roles. For example the added value potential with multinational brand owners divides opinions. Each businessperson stated high potential whereas sales had more distributed answers even though most also stating high and medium potential.

For further analysis the expected frequencies were compared to actual frequencies. From those numbers presented in purple (table 8) it can be seen that especially with cases high potential and no potential business was always more positive than sales. Positive values for high potential case mean that the actual frequency is higher than expected so as table 8 presents business rated potential as high more often than expected values varying between 1,10 and 3,11. Similarly sales rated potential as high less times than expected values varying between -0,44 and -2,78 (table 8). With no potential case the values were the opposite representing exactly same attitude.

However when the relationship between organisational role and added value potential for different company types was measured it turned out that statistically there is no significant relationship as p-value varied between 0,17 and 0,64 for each analysed item (table 8). Thus the findings made by analysing frequencies are not enough to create statistical conclusions. However, it would be interesting to understand what is the root cause between different attitudes as those are clearly visible in these results. It could be related to connections to different companies but also to adoption of the SustainX tool.

Role		AV potential - local customer				AV potential - multinational customer				AV potential - local brand owner				AV potential - multinational brand owner							
		High	Medium	Low	No potential	Total	High	Medium	Low	No potential	Total	High	Medium	Low	No potential	Total	High	Medium	Low	No potential	Total
		Business	2	1	5	0	8	4	2	2	0	8	4	4	0	0	8	8	0	0	0
Customer service	2	4	7	1	14	6	4	2	0	12	2	6	4	0	12	7	3	2	0	12	
Sales	1	17	27	6	51	15	25	7	2	49	14	20	14	4	52	29	17	3	3	52	
Total	5	22	39	7	73	25	31	11	2	69	20	30	18	4	72	44	20	5	3	72	

Role		AV potential - local customer	AV potential - multinational customer	AV potential - local brand owner	AV potential - multinational brand owner
	Chi Square	9.03*	4.26*	6.38*	8.39*
	Degrees of Freedom	6	6	6	6
	p-value	0,17	0,64	0,38	0,21

TABLE 8. Analysis about the relationship between organisational role and added value potential for different company types.

Thirdly the added value potential for different company types was analysed from geographical perspective. Countries were divided into same regions used earlier being Northern, Central, Eastern and Southern Europe. Respondents who did not have country specific responsibility were left out from the categories. Similarly as above analysis was made by using cross tabulation. As an outcome from the Chi square test it can be said that there is almost a significant relationship between added value potential for local customer and region as p-value is 0,05 because values below 0,05 are generally considered to prove the relationship (table 9). In other words there is significant difference between the added value potential seen. For other items there is no statistically significant relationship.

From frequency perspective there are also a few findings to be made as can be seen from table 9. Central and Northern Europe rated the added value potential of the SustainX tool with local customers more frequently to medium than expected. Simultaneously in those regions the given votes for low added value potential were lower than expected. Northern Europe was also more opportunistic with multinational customers as they rated the added value potential to high more frequently than expected. It could be further studied what are the causes behind for being more opportunistic with the added value potential. Are there in fact people with more positive mindset or are the results based on earlier success with using the tool? Moreover, could this be related to the adoption of the SustainX tool so that so-called early adapters would evaluate the added value potential higher?

Region		AV potential - local customer					AV potential - multinational customer					AV potential - local brand owner					AV potential - multinational brand owner				
		High	Medium	Low	No potential	Total	High	Medium	Low	No potential	Total	High	Medium	Low	No potential	Total	High	Medium	Low	No potential	Total
		N/A	2	1	10	1	14	7	4	3	0	14	6	6	2	0	14	13	1	0	0
		1.04	-3.22	2.52	-0.34		2.13	-2.49	0.77	-0.41		2.25	0.08	-1.55	-0.79		4.25	-2.69	-0.97	-0.58	
	Southern Europe	1	3	6	1	11	3	5	2	0	10	2	6	2	0	10	7	2	1	0	10
		0.25	-0.32	0.12	-0.05		-0.48	0.36	0.41	-0.29		-0.68	1.77	-0.54	-0.56		0.75	-0.64	0.31	-0.42	
	Central Europe	2	12	11	2	27	9	12	4	1	26	6	11	7	2	26	15	9	2	2	28
		0.15	3.86	-3.42	-0.59		-0.04	-0.06	-0.14	0.25		-0.96	0.01	0.41	0.54		-2.50	1.61	0.06	0.83	
	Eastern Europe	1	0	5	3	9	2	4	2	1	9	2	2	3	2	9	5	2	1	1	9
		0.38	-2.71	0.19	2.14		-1.13	-0.17	0.57	0.74		-0.41	-1.80	0.72	1.49		-0.63	-0.38	0.38	0.63	
	Northern Europe	2	9	7	0	18	8	8	0	0	16	6	8	4	0	18	11	5	2	0	18
		0.77	3.58	-2.62	-1.73		2.43	0.58	-2.55	-0.46		1.18	0.39	-0.56	-1.01		-0.25	0.25	0.75	-0.75	
	Total	5	22	39	7	73	24	32	11	2	69	19	30	18	4	71	45	19	5	3	72

Region		AV potential - local customer	AV potential - multinational customer	AV potential - local brand owner	AV potential - multinational brand owner	
		Chi Square	20.95*	9.99*	11.71*	10.30*
		Degrees of Freedom	12	12	12	12
	p-value	0.05	0.62	0.47	0.59	

TABLE 9. Analysis about the added value potential for different company types from geographical perspective.

7.7 Added value potential per markets

One of the sub-questions of this study aims to reveal (2) whether there are differences in the experiences between different countries and geographical areas regarding the added value creation through the SustainX tool. The literature review revealed that there are no existing studies about the regional differences of

adopting LCA methodology. Neither there is information available how LCA is utilised in different markets. For example are there regional differences whether LCA is mostly used for marketing purposes or for product design process. Therefore this study concentrated to capture the geographical differences. However, the limitation of the study is that the focus is on using LCA as a consultancy tool and therefore the using methods of LCA cannot be further analysed. To conclude that could be a topic for future studies.

Previous chapters have already analysed how the added value potential of the SustainX tool is seen in different regions. This chapter will further the analysis about the regional differences and define the situation in StickyX target markets. By far it has been revealed that Northern Europe sees the highest added value potential whereas Eastern Europe the lowest. Central and Southern Europe results vary depending on analysed topic. When study focus was on end-use areas they were somewhere in the middle of the scale whereas for company type analysis Central Europe defined higher added value potential rating. Proof for the earlier analysis can be seen from figure 20, in which the added value potential of the SustainX tool is presented by country. Highest and lowest potential are indeed seen by Northern and Eastern Europe respondents.

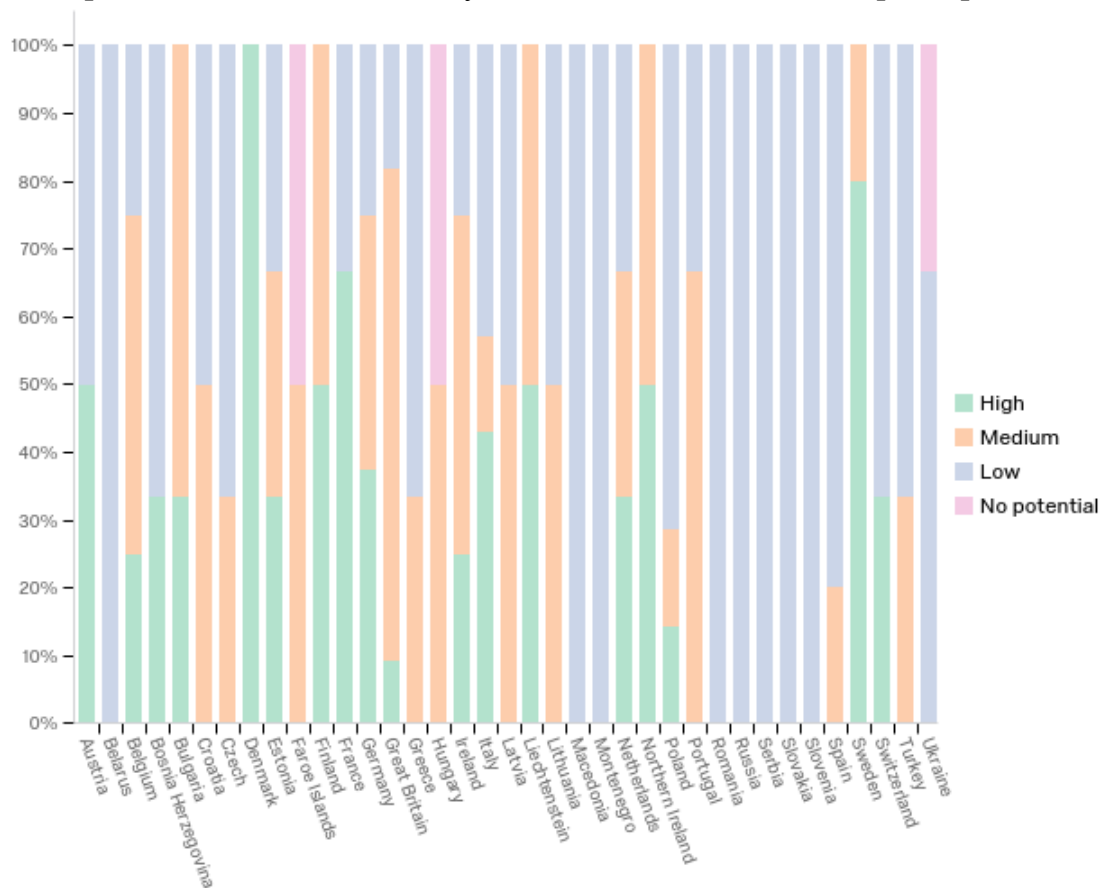


FIGURE 20. Added value potential per country.

The added value potential defined could be expected to be linked to the understanding about the LCA and its possibilities. Therefore it was studied whether there is a relationship between the knowledge level and region. That was also compared to earlier results about the added value potential of the Sus-

tainX tool with hypothesis that knowledge level affects the seen added value potential. The analysis (table 10) revealed that there is no significant statistical relationship as p-value is 0,38. By looking at the distribution of answers from table 10 it can be noted that also the hypothesis was incorrect. For example in Eastern Europe where the added value potential was generally graded the lowest the knowledge level is relatively good by 70% of the respondents having medium and 30% high level. Whereas in Northern Europe the knowledge level is between medium (55%) and high (40%) even though the respondents often evaluated the added value potential the highest. Thus it can be concluded that the knowledge level is not a factor in the added value potential defined.

		Knowledge level				Total
		Weak	Medium	Strong	N/A	
Region	N/A	4 26.67%	4 26.67%	7 46.67%	0 0.00%	15 100.00%
	Southern Europe	1 8.33%	4 33.33%	6 50.00%	1 8.33%	12 100.00%
	Central Europe	5 17.24%	14 48.28%	9 31.03%	1 3.45%	29 100.00%
	Eastern Europe	0 0.00%	7 70.00%	3 30.00%	0 0.00%	10 100.00%
	Northern Europe	1 4.55%	12 54.55%	9 40.91%	0 0.00%	22 100.00%
	Total	11 13.75%	39 48.75%	28 35.00%	2 2.50%	80 100.00%

		Knowledge level	
		Region	Chi Square
	Degrees of Freedom	12	
	p-value	0.38	

TABLE 10. Analysis about the relationship between knowledge level and region.

StickyX has seven main markets, which are France, Germany, Great Britain, Russia, Italy and Poland. These countries were chosen for further analysis. From figure 21 it can be noted that the highest potential is seen in France whereas in Russia the added value potential is the lowest. As explained earlier being recognised as a sustainable company might be one of the reasons to sign a deal with certain markets or companies (Branco and Rodrigues, 2006). Based on the study results it could be said that in France that might be the case but in Russia sustainability or LCA-based information is not a meaningful attribute for deciding about business cooperation.

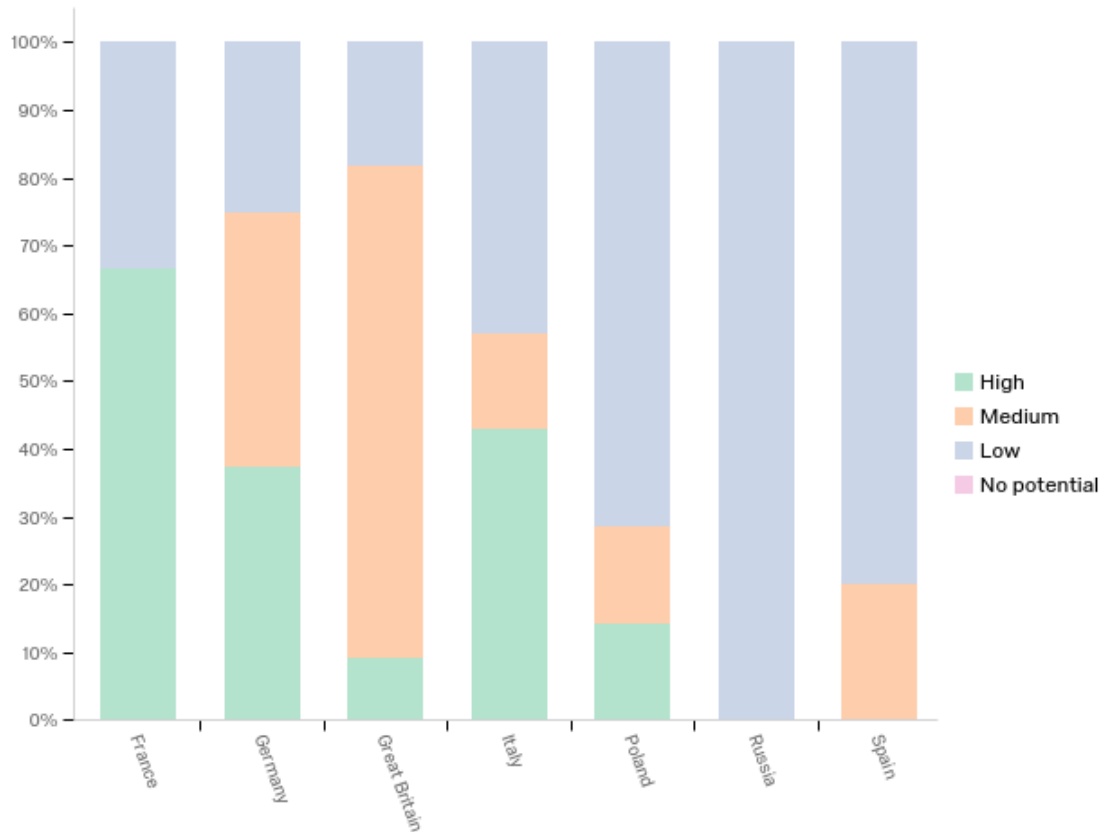


FIGURE 21. Added value potential in the main markets.

As figure 21 represents France, Italy and Germany, are the most progressive with their perception about the added value potential of the SustainX tool. These main countries are the biggest markets based on sales volumes. Therefore seeing high potential with the SustainX tool in the mentioned three countries should automatically be an impulse to direct supporting resources to those countries. The second topic for consideration concerns the rest of the main markets. Should the resources be directed to Great Britain and Poland where the added value potential is seen as medium or low or for example to Denmark and Sweden (figure 20) where there is high potential but simultaneously smaller business opportunities?

8 FINDINGS AND DISCUSSION

8.1 Main benefits and weaknesses

The study aimed at answering to a sub-question on (3) what are the benefits and the weaknesses of the SustainX tool defined by the users. To summarise the answer to the question it could be concluded that the main benefits provided by the SustainX tool are the support for brand image (mean 1,42), knowledge about environmental impacts (mean 1,49) and promotion for sustainable products (mean 1,53) as can be seen from table 3. The main weaknesses of the SustainX tool are the lack of interest from printers (mean 2,38), tool being internal instead of external (mean 2,24) and tool supporting more the other business over the other (mean 2,41) (table 4).

The biggest benefit of the SustainX tool was seen to be the support for the Biofore brand image. As Branco and Rodrigues (2006) present, companies with good sustainability reputation can have better business relationships with customers, suppliers and investors, which might lead into increased business and create economical value. Thus the strengthened brand image plays an important role. It might be interesting to study further whether the brand image is similar for all the stakeholders or would other value StickyX into different level than the others from sustainability perspective. What is the perception by the brand owners and printers and does it differ?

The respondents also felt that the SustainX tool increases knowledge about the environmental impacts. This is also supported by Buxel et al. (2015), who present that LCA does not only add value to the company but also to its employees by providing the means for exchanging information, training and education. Receiving information through SustainX tool about the environmental impacts supports the organisation to create marketing stories, promote sustainable products and design new innovative products with improved environmental performance.

The third benefit of the SustainX tool is the support for promoting sustainable products. Using LCA enables making product comparisons and thus sustainability-based product positioning and marketing communications approach (Buxel et al., 2015). SustainX tool is used for product marketing and can in fact lead into new business creation and thus revenue as Branco and Rodrigues present (2006). However, as LCA is a complex method and the results are varied depending on the chosen environmental impact categories and the presenting type the promotion of sustainable products might be challenging. For example, a new product innovation might have improved process step that decreases the need for water. That however may not be visible if looking at the global warming potential and carbon dioxide emissions. Therefore it is not straightforward to present the environmental performance improvements with the SustainX tool, which always presents the results by using three indicators; water consumption, energy consumption and greenhouse gas emissions.

First of the main weakness was the lack of interest from printers. According to Buxel et al. (2015) talking to the target audience might be one of the challenges of using LCA. If the audience for example only understands the meaning of carbon dioxide emissions but not the other environmental impact categories it might be wise to use global warming potential category as the main indicator (Buxel et al., 2015).

Similarly, in the case of the SustainX tool one of the weaknesses of utilising LCA is speaking to the audience. As presented earlier, 68% of the printers have stated that they are not familiar with LCA methodology or its applications (PRé Consultants bv, 2015). However, it is not only about the audience lacking the understanding but it could be also questioned whether the audience has been correctly chosen. The study by PRé Consultants bv (2015) demonstrates that from those printers not using LCA as many as 73% have ambitions to start using it in the future. The decision is dependent on the available resources and customer demand. Whereas from brand owner perspective the LCA is being seen valuable by 87% of the respondents from which some find it critical, others increasingly or somewhat important (FINAT, 2015).

As a conclusion brand owners are more interested about measuring sustainability with LCA compared to printers. Therefore the SustainX tool primary audience being customers, also known as printers, may not be the correct choice. For the optimal outcome StickyX may consider making brand owners the primary target group instead of printers. However, with the current decision-making model introduced in chapter 5.2 this might be difficult to do in practise. Thus the way of working should be modified so that the SustainX tool is being used for marketing the opportunity for printers about providing LCA based information to brand owners.

SustainX tool is located in internal network, which was also being seen as a weakness. The reasoning behind the current solution is related to study definitions such as system boundaries but also to the limitations of communicating LCA results. A high level of credibility is important when using data for product marketing (Buxel et al., 2015). But it is also required by ISO 14044 standard that LCA studies that are intended to be used for comparative assertion and disclosed to public shall go through a critical review by panel of interested parties (International Organization for Standardization, 2006b), which is relatively comprehensive process. For these reasons the SustainX tool have been made available only internally. However, this might be something to consider in the future especially with the current trend of increasing transparency.

Third weakness was related to tool supporting more paper business division than films and special business division. This is related to product availability in the SustainX tool and even more precisely to overall data availability for conducting LCA. As Buxel et al. (2015) describe, there is sometimes poor visibility to data because the ones conducting modelling do not have access to whole life cycle data such as suppliers' processes or customer's production data. Therefore assumptions are needed when data is not available but that also means that several sensitivity analysis need to be taken which can be time-consuming and costly (Buxel et al., 2015). However, when the lack of data is concerning the more significant factors assumptions cannot be used. Raw mate-

rials are the biggest cause of environmental impacts at StickyX and thus SustainX tool does not include products that would be lacking raw material data. Films and special business division have several special products that do not have raw material data available such as information for producing alternative fibre papers made for example from cotton or bamboo. For that reason it can be felt that the tool does not support product stories of the films and special business division. As future improvements the data availability issue should be reviewed regularly and the product availability increased whereas possible.

8.2 Added value creation

8.2.1 Business end-use areas

The main study question aims at clarifying (1) whether and where the SustainX tool creates added value for StickyX's business. First of all, it can be concluded that the SustainX tool creates added value for StickyX's business. Secondly, it is studied where the value is created by using several focus areas for the analysis. First of them is the business end-use areas.

Added value creation at different end-use areas was studied together with knowledge level, organisational roles and geographical location. The highest potential was seen in food labelling (46%), home and personal care (39%) and wine and spirits labelling (37%). These high potential end-use areas were used for further analysis.

One of the hurdles in using LCA is the complexity of results and conclusions. As Buxel et al. state (2015) LCA can cause difficulties in communicating the results especially when the audience is not familiar with the multidimensional results. Therefore it could have been expected that knowledge level has an impact to the added value potential seen.

The relationship between knowledge level and added value potential was studied by using cross tabulation and correlation. Fisher's exact test indicated that there is no significant relationship between the studied factors but correlation coefficient revealed small positive correlation. However, when correlation was studied further it turned out that only 3% of the result could have been explained by each other's meaning that 97% of the outcome was still depending on other factors. Therefore the correlation coefficient is not reliable.

Even though it was not possible to prove by statistical testing that the knowledge level would affect the added value potential it can be noticed from table 5 that in this study sample in food labelling and home and personal care labelling the higher the knowledge the higher the potential. This seems logical especially in case with low knowledge. If you do not understand LCA yourself how can you see high potential in using it with customers or brand owners? But if your knowledge about LCA is on high level you can still feel that LCA does not create added value for example in case where there are remarkable weaknesses to overcome. The noticed relationship in this sample might however be random occurrence and should not be used for statistical generalisation.

Secondly added value creation was studied from organisational role perspective. Cross tabulation revealed that there is no significant relationship between the role and the added value potential defined. However, when analysing frequencies it turned out that business organisation evaluates the added value potential of the SustainX tool higher than the expected in each high potential end-use areas being food labelling, home and personal care and wine and spirits. Overall, when talking about high added value potential business organisation is more positive than sales or customer service organisation. There might be several reasons behind.

Respondents of the business organisation have roles varying from business development, end-use segment management, marketing and brand relations to leading business areas. In other words business organisation develops new products and concepts for enabling serving the market. Even though StickyX sells self-adhesive labelstock material to printers the focus of the business organisation is in fact with the brand owner needs. Whereas the role of the sales organisation is to sell material to printers to enable them serving brand owners. The key driver for the printer is serving brand owners quickly and with high quality, which in StickyX end means stable supply and good availability. Customer service is in the frontline when discussing with printers and handling daily activities regarding orders and complaints.

The different roles can explain some of the different views. Business organisation develops new concepts based on market intelligence. It might be that they are able to notice changes in the general discussion where sustainability is an importantly rising topic. It is also their job to create new marketing aspects that could be used for selling arguments by the sales organisation. However, the importance of sustainability may not be visible for sales and customer service in their daily work either because it takes time for topics to cascade in the value chain or because printers do not find the topic interesting.

Another finding from frequencies regarding organisational roles is related to seeing no potential in the wine and spirits end-use area. There were more responses than expected from sales saying that there is no potential. This would be interesting topic for further analysis because wine and spirits end-use area has been actively using the SustainX tool. Is there a specific weakness in the tool itself why 12% of the sales stated no potential?

One reason behind might be related to data availability. Also Buxel et al. (2015) mention lack of data being one of the LCA limitations. As they explain, the accuracy of LCA depends on the quality and the availability of relevant data and sometimes when data is not available assumptions need to be made (Buxel et al., 2015). This is also the case with StickyX's life cycle assessment. However, the assumptions can only be made in regards of non-significant data flows that play relatively small role in the overall results. As explained earlier it has been defined that in StickyX's case most of the environmental impacts come from raw materials. Therefore it is impossible to use assumptions for supplement in-compliant raw material data. This on the other hand leads into situation where there are several wine business specific materials missing from the SustainX tool due to their special raw material basis. This can create frustration in the

sales organisation if they were interested about using the SustainX tool for product marketing.

As one of the sub-questions of this study is to find out (2) whether there are regional differences in the added value creation potential through the SustainX tool the regional aspect was taken into consideration also with end-use area analysis. In food labelling and home and personal care the results were almost identical and showing that the highest added value potential is seen in Northern Europe whereas the lowest in Eastern Europe. This is in line with other regional findings as presented in chapter 7.7. For the wine and spirits end-use area the results differ from other high-potential end-use area results. Northern Europe again is the most positive and Eastern Europe the most negative but there are also 14% of the Eastern European respondents evaluating the added value potential as high. As Eastern Europe does not include traditional wine production countries the number is probably more related to spirits business. This however is quite unique finding because sustainability has not been a visible differentiating factor earlier in the spirits business. Assuming that this conclusion is correct this might give competitive advance through product differentiating and marketing (Branco & Rodrigues, 2006; Buxel et al., 2015; Kotler et al., 2013). However as Branco and Rodrigues (2006) highlight the competitive advantage can only be enjoyed as long as it is something new in the market. Thus it would be extremely important to react into this finding quickly to capture the benefit of the frontrunner position.

Another finding is related to the high added value potential defined in Southern Europe together with quite many respondents stating low added value potential. In other words there are two big respondent groups with diverse opinions and only small group having opinion in between. It would be interesting to further study what is the connection of the results and the organisational role. Are the results similar as presented above meaning that positive evaluation has been given by the business organisation and low added value potential defined by the sales and customer service? If that were the case it would indicate based on earlier analysis that Southern European sales organisation sees lower value in the SustainX tool compared to other user groups. This could be again related to product availability, as in the Southern European market wine industry is one of the biggest end-use areas.

8.2.2 Company types

The company types were studied to continue analysing (1) where the SustainX tool creates added value to StickyX's business. The results of seeing added value potential in certain company type were connected to information about the knowledge level, organisational role and geographical differences. Most of the analysis was done by using cross tabulation but also correlation calculation and frequencies were used for strengthening the analysis.

The assumption was that brand owners are more interested about sustainability and LCA than printers and moreover multinational more than local. This was also the outcome from the study made by PRé Consultants bv (2015),

who analysed the LCA usage in the self-adhesive labelling industry. As expected multinational brand owners were seen as the highest added value potential target group whereas local customers the lowest. In this study it was analysed whether there is a link between knowledge level and the added value potential defined. The outcome of the cross tabulation was that knowledge level is not affecting the defined added value potential in different company types.

This, however, was the result from StickyX organisation. If the knowledge level in different companies was studied the results might be different. It could be expected that companies with high-level LCA knowledge are more responsive to the SustainX tool results. LCA can bring value to the organisation as a “door-opener” and enable discussions with decision-makers instead of purchasers (Buxel et al., 2015; Kotler et al, 2013). By using LCA for product marketing might lead into strengthened business relationship and joint development projects (Buxel et al., 2015). Thus focusing on companies with already existing knowledge about LCA might be business-wise logical.

On the other hand, the strategy could also be totally different by choosing to focus on local printers. If thinking the different company types it can be generalised that local printers do not have wide resources whereas multinational printers do. Local printers are also more dependent on big brand owners whose regular order might use most of the printer’s capacity. If we are able to define that multinational brand owners are the most potential target group for sustainability-based information that means that their requests are eventually cascading back in the value chain. The strategic decision could be to focus on local customers and provide the most support for them regarding LCA. That consultancy service would help them to serve multinational brand owners in unexpected level that could appear to StickyX as a strengthened business relationship and in the end as additional revenue.

Secondly it was studied whether there is a difference on how people in different organisational roles define the added value potential in each company type. As an outcome of a cross tabulation it turned out that there is no significant relationship between the role and the added value potential. However, when further studying that by using frequencies it turned out that especially with high and no potential cases business was always more positive than sales organisation. Similar finding was made with end-use areas where the reason could have been linked either to different ways of looking sustainability from role-related typical perspective or to product availability. Here the most probable reason is related to role differences because sales and customer service is normally working with printers whether they are local or multinational. Whereas business is more focused on brand owners. This could be a signal that the sales is not able to utilise the SustainX tool for value creation as expected for example due to lack of interest by printers. This raises a challenge. Has StickyX created a tool that does not fit for the purpose because of using it with wrong target group? If that is the case the SustainX tool should be used more with brand owners or printers should be educated on how the information can be utilised for their success in the relationships with brand owners.

Thirdly it was analysed whether geographical location is connected to the given answers regarding added value potential in different company types.

By using cross tabulation it was found out that there was almost a significant relationship between added value potential for local customer and region (p-value being 0,05 and limit <0,05). When the frequencies were analysed Central and Northern Europe seemed to evaluate the added value potential for local customers higher than expected. Similar situation was with Northern Europe's evaluation on multinational customers. These findings are interesting because they differ from the study hypothesis and other given evaluations.

The outcome might be related to positive earlier experiences or to the adoption of the SustainX tool. If people have succeeded in utilising the tool in their customer meetings this might be visible in the answers. Alternatively this might be related to the adoption process of the SustainX tool. As presented by Kotler et al. (2016), adoption process consists of five steps that are awareness, interest, evaluation, trial and adoption. Generally new innovations go through adoption process in which approximately 2,5% of people adopt innovation right away being so-called innovators (Kotler et. al, 2016). After them so-called early adopters (13,5%) are the ones to follow and continued with early majority (34%), late majority (34%) and laggards (16%). Thus the results might indicate that Northern and Central Europe have early adopters and therefore able to see opportunities also with local customers that other tool users are not yet able to see.

Additionally Northern Europe being more progressive with their opinions could also be linked to organisational roles as the headquarter of StickyX is in Finland and many leader positions in business organisation are located in Finland. Based on earlier analysis about the differences in roles and their views regarding sustainability as a competitive advantage that might explain partly the results also in this case.

8.2.3 Geographical differences and target markets

This study aims at clarifying (2) what are the regional differences in seeing added value potential in the SustainX tool. As has been discussed already earlier there are some clear differences visible within different regions. In general Northern Europe seems to be the most positive with added value creation whereas Eastern Europe the least positive. Central Europe and Southern Europe are situated in the middle with varying answers depending on the measured topic.

As also explained earlier knowledge level was not defined to be the factor affecting the seen added value potential although that was the hypothesis. Russia was used as an example country for the analysis and their self-evaluation about their knowledge was on high level. However, this study utilised self-evaluation in which people can rate their knowledge level higher than the actual level would be. Self-evaluation is always influenced by personal and cultural attributes and that of course is the limitation of this study. Therefore it might be possible that there is some link between the knowledge level and the defined added value potential even though study results did not support that. It might be beneficial to test the knowledge level with more structured testing where respondents were truly tested regarding their knowledge against other

respondents. That would provide more reliable data, which could be used for planning trainings to increase the added value creation with the SustainX tool.

The results raised a question on where the resources with the SustainX tool should be directed. As discussed, the seven biggest countries in Europe are defined as target markets for StickyX. From those countries France, Germany and Italy are already relatively positive with the capability of the SustainX tool for creating added value to the business. However, are the rest four countries strategically correct choices to push the SustainX tool and give extra attention to their sales organisations for using the tool and engaging with their customers? These big countries being Poland, Great Britain, Russia and Spain have big sales volumes but especially some of the countries do not see great value in using LCA for product marketing. It might be wise to confirm that organisation has the capability and required knowledge to utilise the SustainX tool with customers and brand owners who value sustainability-related information. However, it may not be efficient use of resources to push the SustainX tool with Russian customers and brand owners.

Alternatively the resources could also be directed to countries where the added value creation potential is defined to be high such as Denmark and Sweden. These countries may not have the biggest business size but still remarkable enough and always competing with competitors on getting new business. As sustainability is increasingly defined to be one of the decision-making factors in Scandinavia it would be worth utilising for getting competitive advantage and signing a business deal (Branco and Rodrigues, 2006). Using the SustainX tool for educating customers to serve their brand owners can help StickyX to get new business. Particularly, with multinational companies whether they are printers or brand owners that can lead into widening the business relationship to other countries as well. Getting a multinational brand owner interested from the sustainability topics can lead into joint-development which in the end will be visible in all markets they operate and cascade back to printers and thus to StickyX. That kind of case would be a great example how comprehensive the benefits of using LCA can be and how in the end it will create revenue to the company.

As discussed earlier there is quite a limited amount of literature existing about the usage of LCA and there are no existing studies available about the regional differences on the topic. Chapter 4 described that LCA can be used for strategy development, research and product development, supplier selection and production, marketing, sales, information exchanging, training and education and as a consultancy tool. This study has focused on using LCA based data in a consultancy tool called SustainX tool. As an outcome it can be concluded that there are some regional differences on how the tool has been adopted and how high the added value creation potential is seen by the users.

8.3 Research limitations and topics for future research

One of the most important factors in this study is the study questionnaire because it provides the information that can be used for analysis. However, as Valli (2017) describes, one of the biggest risks for the study is creating bad questions. The questionnaire was created with a clear idea about the study purpose but the practical data analysis revealed some limitations. First of all, the type of question format defines what kind of data can be received from the questionnaire. Secondly, more detailed analysis would have required more information about how the added value becomes concrete business benefit and what is the role of the SustainX tool in the door-opening process. These choices made at the beginning of the study do limit the analysis and the future utilisation of the research inside StickyX. However, as this study provides first ever scientific information about the use of the SustainX tool the company could use the information as a basis for studying the topic more.

As mentioned earlier there is very little earlier research available about the usage of LCA whereas most of the available literature are case studies with certain focus point – most often focusing on design angle. There is far less available literature about using LCA for marketing or as a consultancy tool. Moreover, there is no existing literature about the regional differences on using LCA. Therefore this research could provide new information regarding the topic.

However, there are few limitations in this study for creating new research about the regional differences on utilising LCA. This study is only focused on one value creation method being the consultancy tool aspect and simultaneously the questionnaire can only reveal the way of using the tool itself but not properly how the information is shared going forward – is it only shared or also discussed, who are the people in the discussion, are they purchasers or decision-makers such as marketing and package designers, how the process continues after the interest is raised and how StickyX is able to map the new volumes from one brand owner project when the order comes through printer. Understanding these aspects would provide more information on how the SustainX tool in reality creates the added value.

Another limitation is related to different value creation methods. First of all, this study concentrates only to the value creation through using LCA as a consultancy tool and for example using LCA for marketing purposes was referred only briefly. Thus there would be room for future research about the other value creation methods such as product marketing or strategy development.

Secondly, this study is unable to provide information about the regional differences on using LCA for example for product marketing, strategy development, education and product development. As Buxel et al. (2015) presented there are companies who have published their LCA based research even though it is not positive for them just to contribute to general discussion. That is a good example of a business decision that could have been affected by cultural attributes. If for example thinking Japanese culture where loosing your face is the worst thing that can happen one could question whether a Japanese firm would publish fact-based information about their product being less environmentally

friendly than its alternative products. Thus getting more information about the regional differences on using LCA would benefit from further studies. Especially analysing the usage of LCA for product marketing might reveal valuable information that could be used for developing the communication of the results. At the moment it could be questioned whether all available LCA data that is used for product marketing has truly undergone a critical panel review as ISO 14044 requires (International Organization for Standardization, 2006b). Further study on the subject on regional differences could reveal whether following the standard is linked to geographical location and thus also support improving credibility of the LCA for consumer communications.

9 CONCLUSIONS

The main research question of this study was (1) whether and where the SustainX tool creates added value to StickyX's business. The scope was limited to cover the European market region of StickyX. There was a structured multiple-choice questionnaire created for collecting information from StickyX sales, customer service and business organisation. Non-random sampling was used for ensuring needed number of responses meaning that all sales, customer service and business people were invited to answer the questionnaire. From 236 people 170 answered equalling to 72% response rate. Therefore it can be concluded that the coverage for further analysis is on necessary level.

The questionnaire included questions that used nominal, ratio and Likert scale. The methods for analysing answers varied from cross tabulation and Chi square test to utilising frequencies, correlation and statistical values. The data proved that the SustainX tool creates added value to StickyX's business. Further analysis clarified that added value creation potential differs in business end-use areas, company types and regions.

The highest potential was defined to be in food labelling, home and personal care and wine and spirits business end-use area. These high-potential end-use areas were further analysed to clarify whether knowledge level, organisational role or regional location has an impact to the evaluation. It turned out that knowledge level, at least statistically, is not linked to the defined added value potential whereas there are differences on how people in different roles or locations experience the added value creation.

Another finding was that the SustainX tool creates added value with better probability when used with brand owners and more precisely multinational brand owners instead of local or multinational customers. Also this was further analysed by comparing with knowledge level, role and regional location. The results did not show connection between the knowledge level and the added value creation potential in this study scope. However, it could be assumed that knowledge level of the target audience is connected to the added value creation through LCA and the SustainX tool. This could be further studied to understand the possibilities and main hurdles for the "door-opening" feature and improve the value creation opportunities with LCA.

Similarly as with business end-use areas the organisational role seems to affect the defined added value potential with different company types. According the results sales is often less positive than business organisation regarding the added value creation. This can be linked to their target group emphasis as sales is mostly operating with direct customers whereas business is more focused to reaching brand owners and offering solutions for them. Thus business might see value for offering sustainability related information to the market, as brand owners are the ones who are setting ambitious sustainability targets and looking for more sustainable options. At the same time printers are not driven by sustainability and consumer trends but more with efficiency and capability

to serve brand owners, which might be visible in the lack of interest towards the SustainX tool.

This study aimed at also clarifying (2) what are the differences in experiences between different countries and geographical areas regarding the added value creation potential of the SustainX tool. The general conclusion is that regions have differences and Northern Europe is the most advanced whereas in Eastern Europe the defined added value potential is the lowest. There are extremely high-potential countries such as Denmark and Sweden but also many countries where the potential was graded as low. From the seven biggest markets only three looked promising in terms of creating added value with the SustainX tool. The strategic decision would be needed to decide whether to push the SustainX tool with the four not so promising bigger markets or focus on smaller high-potential countries. The so-called quick-win of course is to prioritise and provide resources to the defined three advanced countries being France, Germany and Italy.

Another study sub-question was to describe (3) what are the weaknesses and the benefits of the SustainX tool defined by the users. The main benefits of the tool are support for brand image, knowledge about products' environmental impacts and promotion for sustainable products. On the contrary, the main weaknesses are lack of interest from printers, tool format being internal instead of external and uneven support for different business areas. The results revealed some improvement possibilities for example regarding the product availability in the SustainX tool and raised topics for re-evaluation such as tool format and decided target groups.

This study was focused on evaluating the added value creation potential through the SustainX tool. It would be interesting to further the analysis to clarify how the SustainX tool in reality starts a value creation process and when StickyX can measure the value with monetary terms or will it ever be clearly measurable. Moreover, how do printers and brand owners define the value created with the SustainX tool? The limitation of the study is that it concentrated only to the value creation through a consultancy tool and for example using LCA for marketing purposes was referred only briefly.

As there was very little literature available regarding the value creation with LCA and not at all about the regional differences it would be recommendable to study the topic further. Especially analysing the sales and marketing value creation aspect could provide entirely new information for sustainable product marketing taking the environmental performance discussion further from current ecolabelling overload and debate.

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APPENDIX 1

What is your gender?

- Male
- Female

How old are you?

- 24 or younger
- 25-34
- 35-44
- 45-54
- 55-64
- 64 or older

Which of the following best describes your organisation?

- Business
- Customer service
- Sales

Please, choose your responsibility areas from the list.

- No country specific area
- Andorra
- Austria
- Belarus
- Belgium
- Bosnia Herze-govina
- Bulgaria
- Croatia
- Cyprus
- Czech
- Denmark
- Estonia
- Faroe Islands
- Finland
- France
- Germany
- Great Britain
- Greece
- Hungary
- Iceland
- Ireland
- Italy
- Latvia
- Liechtenstein
- Lithuania

- Luxembourg
- Macedonia
- Malta
- Moldova
- Montenegro
- Netherlands
- Northern Ire-land
- Norway
- Poland
- Portugal
- Romania
- Russia
- San Marino
- Serbia
- Slovakia
- Slovenia
- Spain
- Sweden
- Switzerland
- Turkey
- Ukraine
- My responsi-bility area is not available

Have you heard about the SustainX tool?

- Yes
- No

Have you used the SustainX tool?

- Yes
- No

If you haven't used the SustainX tool, what is the reason behind? Choose the option that best reflects your situation.

- I don't know how to use it
- The topic is unclear to me
- I don't see the value of the tool
- My customers or brand owners are not interested about environmental topics
- I don't know how to access it
- I don't have time to use it

Which of the following best reflects your user activity? "I use the SustainX tool..."

- 1-2 times a year"
- 1-2 times in 6 months"
- 1-2 times in a quartile"
- 1-2 times in a month"

- 1-2 times in 2 weeks"
- 1-2 times a week"

Select the option that best describes your audience in regards of using the SustainX tool results.

- Local customer
- Multinational customer
- Local brand owner
- Multinational brand owner
- Local customers and brand owners
- Multinational customers and brand owners

How do you use the SustainX tool? Please, select the option that best reflects your activities. EoL means the end of life scenario for liner waste (incineration, recycling or landfill).

	Always	Often	Rarely	Never
I only open the front page				
I calculate results only for one product without comparisons				
I make one product comparison				
I make one product comparison and change EoL scenario to see how that affects the results				
I make several product comparisons				
I make several product comparisons, in which I change the liner EoL scenarios to see how that affects the results				

How do you utilise the SustainX tool? Please, select the option that best reflects your activities.

	Always	Often	Rarely	Never
I send results in PDF to customer / brand owner				
I use results for presentation				
I use the SustainX tool together with a customer / brand owner				
I use it for my own interest				

Do you feel comfortable to explain the SustainX results by yourself to your customer / brand owner? Please, select the option that best reflects your opinion.

- No, I would need training about LCA
- No, I would need more detailed information behind the SustainX results
- I know the basics of LCA methodology but I am not comfortable to discuss about the SustainX results in detail
- I am comfortable to discuss even about the details of the SustainX results
- I don't need to explain the results. It is enough to show them.

According to FINAT RADAR study, life cycle assessment (LCA) is becoming more important topic for 48% of the brand owners. The following questions will give you an opportunity to tell where the highest added value potential of the SustainX tool is on your opinion.

Please, evaluate the added value potential of the SustainX tool in your own market area/-s.

	High	Medium	Low	No potential
Country 1 ...				

Please, evaluate the added value potential of the SustainX tool in the following end-use areas.

	High	Medium	Low	No potential
A4 & cut-size labelling				
Beverage labelling				
Brand protection & security labelling				
Digital printing				
Durables labelling				
Food labelling				
Home care & personal care labelling				
Pharmaceutical & health care labelling				
Oil & industrial chemical labelling				
Postal applications				
Retail labelling				
Transport & logistics labelling				
Tyre labelling				
Wine & spirits labelling				

Please, evaluate the added value potential of the SustainX tool in the following company types.

	High	Medium	Low	No potential
Local customer				
Multinational customer				
Local brand owner				
Multinational brand owner				

What are the benefits of using the SustainX tool? Please, evaluate the following statements.

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
I learn more about the environmental impacts of products					
I can promote our products as sustainable options					
Results support our sales messages (e.g. FIT range, RX15)					
It helps engaging with customers / brand owners					
It supports our BioFore company brand image					
It is our competitive advantage					

What are the weaknesses of using the SustainX tool? Please, evaluate the following statements.

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
It is difficult to use					
Printing houses are not interested about the environmental impacts					
I don't see the value of the tool					
Internal version is not enough - it should be available externally					
I can't find the products that I would need for my purpose					
I would need more tailored LCA calculations					
It supports more PaBu than FSB					

What would increase the value of the SustainX tool in the future? Please, select all applicable examples.

- It should be directed to brand owners instead of printing houses
- It should be available externally
- There should be more products available
- Instead of adding more products there should be representative products from each product range
- There should be one "optimised" product available for each end-use area
- There should be detailed information about the background of the results

