



Integrating Sustainability Into Jewelry Business

Case: X - Jewelers

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<p>Abstract:</p> <p>Sustainability is an evolving concept and, in order for businesses to become sustainable, it is essential to constantly improve activities of their value-chain accordingly. A sustainable business considers potential impact of their product, process and activities on the ‘triple bottom line’ of sustainability – environment, society and economy and makes gradual efforts to place these factors in complete harmony.</p> <p>This study is inspired by the current environmental and ethical movements, where companies should be aware of their business’s impacts on both internal and external environments as well as comply with arising regulations. Instead of solely focusing on ‘greening’ of businesses, importance should be given to applying the Circular Economic concept from the beginning of the business process to succeed in the long-run. Another area highlighted by this study is sustainable level of natural resources use for jewelry production and, the current state and future scarcity of precious metals relevant to the case company’s jewelry business. Natural resources are limited and thus, it is important for businesses to find innovative designs and production methods to reduce waste, reuse by upcycling the end-of-life (EoL) components as well as acquire materials from alternative sources while leaving positive ecological footprints.</p> <p>This study analyzes all the possible impacts of the case company’s jewelry business by considering the total product life-cycle. It includes important sustainable models – CE / Upcycling, LCA and LSCA as well as empirical results to guide the case company’s jewelry business towards the sustainable path. The results of this research is believed to be valuable in other businesses’ context as well.</p>	
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1. INTRODUCTION

This is a qualitative case study of a New York-based jewelry business. Due to the changing market scenario, and to address the environmental and social changes; the case company seeks to analyze and improve their level of sustainability by finding applicable solutions through this research. The focus here would be to bring a total sustainable transformation by addressing the ‘triple bottom line’ of sustainability – environment, social and economy, also known as planet, people and profit.

This research explores the current sustainable theories to understand the basic concept of sustainable business. As there is not sufficient literature available which only focuses on sustainable business / sustainable jewelry, it is important to analyze concrete discourse from the sustainable development and environmental science areas i.e., Circular Economy and Life Cycle Sustainability Assessment (LCSA) models to be integrated into the jewelry business.

Together with the literature and empirical data, this study will analyze the most sustainable and ethical materials related to the jewelry business i.e., current state of natural resources and scarcity, social and ethical impacts, environmental impacts etc. Furthermore, this study will suggest the best way to integrate sustainability into the case company’s jewelry business by finding eco-design and eco-process.

1.1 Background

The major idea of this study is inspired by the current climate change movement and ethical sourcing. As the global market expands, it brings consumers closer and makes products more accessible. With the speed of web, various social media channels and constant development in technology, today, information about products and services flow even faster than before. Consumers can now exchange ideas, provide feedback as well as express their current and future need in just one click. ‘We are on the cusp of non-media mass communication

(citizen-to-citizen learning, using the web). This has implications for the way information is stored and exchanged (search engines versus libraries), how information becomes knowledge and how opinion gains authority. These offers both opportunities and risks to the formulation and dissemination of new paradigms for imaging the planetary future.” (IUCN, 2006)

Eventually, customers are more aware of the product environment and, they have up to date knowledge about the market trends and product awareness. “Demand for an industry’s product is affected by changes in the lifestyle, tastes, philosophies, and social conditions of the buyer population which any society tends to experience over time.” (Porter, 2004, p. 165). In such a fast-paced world of demand, many companies attempt to introduce new products and services accordingly. Between the year 2007-2009 eco-friendly products launches increased had been increased by more than 500% (Ettenson, 2010).

“Product innovation can widen the market and hence promote industry growth, and/or it can enhance product differentiation.” (Porter, 2004, p. 177). Thus, it has become essential to meet ever changing market demands either by constantly innovating new products or by improving the existing products e.g., adding new features and functionality.

Meanwhile, due to recent awareness of environmental issues e.g., climate change, biodiversity loss and, resource depletion etc., businesses should also put their focus on addressing such matters. The environmental/sustainability reports have changed stakeholders’ perspective about production, consumption and its environmental and social impacts. Also, this raises questions about scarcity as well as ethics concerning certain natural resources (raw materials) due to overproduction/overuse (UN, 1997). According to the new environmental sustainability report, every year the earth’s total capacity has been used 2-3 folds more than it is supposed to (Koumoundouros, 2016-2019). Recycling is not as easy as we think, and waste disposal management has been a big challenge too. It is feared that due to the impact of over-extraction and over-consumption of materials, companies could face a huge scarcity of raw materials in the near future.

However, when there are issues there will be solution too. Environmental responsibility can be a platform for both growth and differentiation for corporations (Porter, 2004). While the

solution to address changes should be done promptly. The fact is that the arising challenges in the market space (organizational & institutional environment) (Zaheer, 1999) also brings new opportunities for businesses. By creating a new platform to solve new group of consumer demand businesses could also thrive into it by increasing revenue through the newly explored areas of sustainability. By addressing the future issues, businesses could provide additional value to customers e.g., by creation of additional ecological services.

Thus, jewelry business also cannot escape from these arising sustainability challenges. Operating business in a traditional manner and running just one CSR project is not going to be enough anymore in the current situation. Due to growing knowledge of stakeholders about the environmental and ethical matters, businesses should be able to re-design products and services as well as the whole organizational structure from the scratch to move towards greener zone (Daniel C. Etsy, 2009). It starts from choosing ethical raw materials to recycling and reusing the products to complete a full product life-cycle sustainably. Additionally, by innovating sustainable services to maintain ‘circular economy’ (Ghisellini, 2015).

The current environmental discussions have been mostly about climate change and its possible drivers e.g., plastic usages, meat consumption, transportation and the impact of fossil fuels etc. Thus, it feels essential to also analyze jewelry business’s ecological footprints before it becomes a major issue and find solutions accordingly.

Implementing consumer values to meet business values is important. At the same time, companies should be able to meet stakeholder values by strategically planning and executing sustainable ideas.

1.2 Purpose of the study and research questions

The key purpose of this study is to guide the case company’s traditional jewelry business towards more sustainable path. It includes exploring the most sustainable way of acquiring

and selecting raw materials for jewelry production, optimizing the process and improving services. While doing so, this study aims to find solutions to create value-proposition among the case company's business and its stakeholders i.e., consumers, society and especially, the environment – to leave greener environmental footprint.

To serve the purpose of this study, the objective would be to explore appropriate sustainable strategies to implement into the case company's jewelry business to transform products, packaging and process to make them eco-friendly. Analyze sustainability and ethics of materials used for the jewelry-making e.g., silver, gold, and precious stones etc. To achieve solutions, it is also important to address the current issues of sustainability and its issues related to jewelry business.

Furthermore, the objective is also to focus on finding solutions to redesign a product-line in a more sustainable manner, finding the most sustainable materials for packaging and process. Explore the current sustainability trends and discover additional services to be added to enhance 'circular economy' of the business.

To achieve the above-mentioned purpose, this study aims to answer following questions:

Research Question: How can sustainability be integrated into case company's jewelry business?

Supporting Questions:

- How can the case company's jewelry business become sustainable?
- How can we measure sustainability of jewelry business?
- Which materials are the most efficient and sustainable for product and packaging?
- What are the most sustainable ways to acquire resources for jewelry business?

1.3 Scope and Limitations

The two major areas of this thesis include the concept of sustainability and circular economy. Sustainability is a vast concept as it includes various areas from environmental sustainability to business sustainability.

Since the purpose of this study is to develop a sustainable product development plan for the case company's jewelry business, the author chooses to limit the study areas to sustainability in business, and sustainable theories only related to jewelry business and its impact on the environment, social and economic factors.

Under sustainability literature part, the author explores the theories and models of sustainability in business e.g., triple-bottom-line, life cycle analysis, life cycle sustainability analysis and most importantly, circular economy concepts. The literature also explores the sustainable level of natural resource use for jewelry production. The empirical part includes ethical resource acquiring, sustainable production, material efficiency and eco-service improvement of jewelry business. Simultaneously, this study analyzes the factors affecting 3Rs (Reduce, Recycle & Reuse) concept of sustainability in terms of materials used in the case company's jewelry business e.g., resource efficiency, design, remaining stocks, market value etc.

1.4 Case Company

The case company chosen for this study is a New York-based jewelry business. It is a SME apparel and accessories wholesaler established in 1991.

This study will solely focus on the case company's precious jewelry retail business and the branch's activities. According to the company's preference, anonymity is maintained in this research by calling the case company 'X-Jewellers'. The company introduced their own retail jewelry business a few years ago and currently is focusing on creating new models according

to the current market demand. The major market currently is focusing USA and ultimately would look for expansion abroad.

The new line of design is contemporary jewelry concept inspired by Scandinavian and Nordic designs and have been mostly produced in its internal facilities as well as designers' studios in the Nordics. Due to changing customer preference and the market scenario, the company is analyzing methods to integrate sustainability into their jewelry business in the most efficient way.

1.5 Thesis Structure

This case study starts by introducing the background and need of the research. Then, it explores the literature base relevant to the topic to provide base for the empirical part. Major literature for this study is based on sustainability, sustainable business and circular economic concepts. With the support of major ideas and models behind literature review, the interview guide and observation format is set. As the research method of this study is qualitative, new information will arise while analyzing the findings. Thus, additional literature would be added accordingly to support the findings. The empirical results are then further discussed with the literature base to answer the research questions formed earlier in this study. Finally, the study is concluded by stating the major points from the overall research; and the most applicable sustainable solutions would be suggested for the managerial implication. Since every research cannot be complete by itself to provide solutions to the mass, the limitations and further research possibilities in this area would be suggested as well.

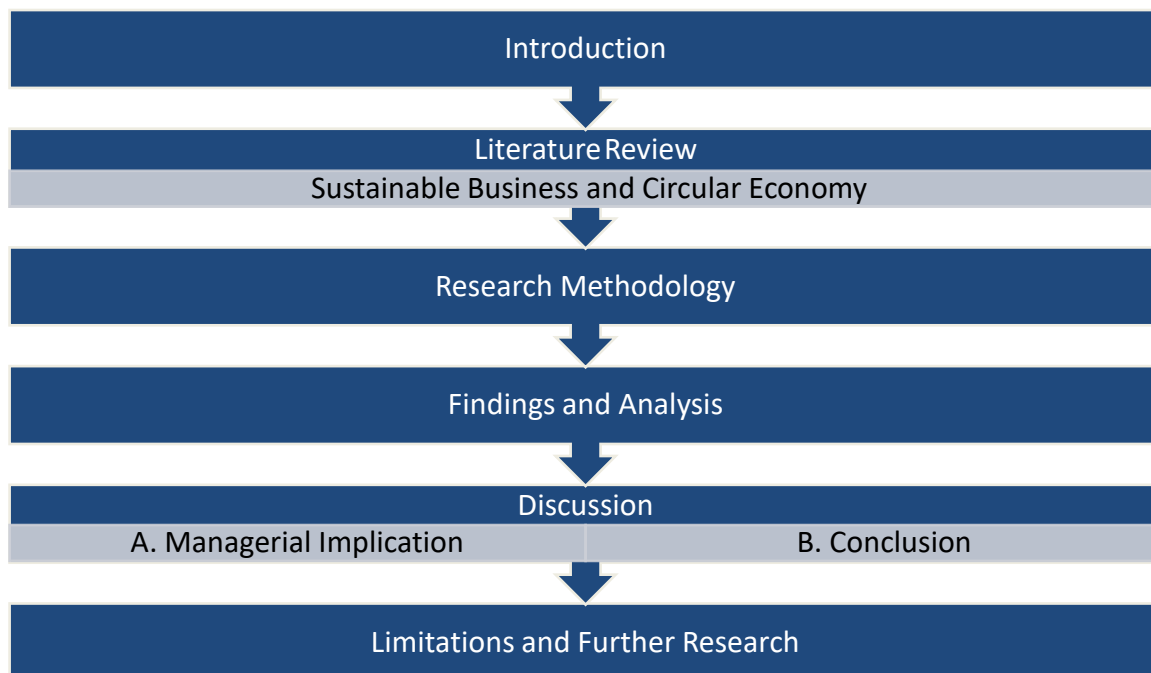


Figure 1. Thesis Structure

2 LITERATURE REVIEW

2.1 Sustainability

Sustainability is a vast concept that is up to some extent in use in all governments, communities and businesses (Adams, 2006). To understand Sustainable Business, it is vital to get the idea behind the holistic concept of sustainable development too.

The definition of sustainable development has evolved since it was first introduced more than 30 years ago. The Brundtland Report first defined sustainable as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland, 1987). It means that we must think of the future consequences while making decisions in the present. The definition addressed the issue of environmental degradation that often follows economic growth at the same time pointing out the need for development to eliminate poverty. (Adams, 2006). The Brundtland report’s definition has been widely used ever since, although many new adaptations have emerged. Sustainability remains an open, dynamic and evolving concept and thus it can be redefined and reinterpreted to fit very different needs depending on the level, place and context (Kates, 2005).

2.1.1 Models of Sustainability

a) Three Pillars

The definition on sustainability is most commonly divided into three sectors that are - economic, social and environmental or ecological sustainability. Sometimes also culture is included as a dimension of sustainability in a context of finding, preserving and transferring information to future generations. To achieve sustainability completely the three core dimensions – Environmental, Economic and Social should be in complete balance. (Adams, 2006, pp. 29-31).

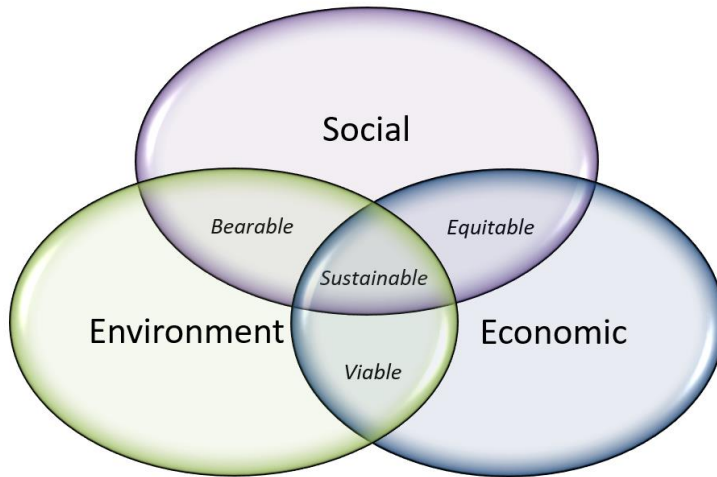


Figure 2. Adapted from *Three Pillars of Sustainability* (Adams, 2006)

The three core dimensions of sustainability can be visually presented for example as pillars, circles or interlocking Circles. Of these models, the three pillars model suggests that trade-offs can always be made between environmental, social and economic dimensions of sustainability. In the present time governments, businesses and other actors put more emphasis on the economic dimension and do allow trade-offs. However, this should not be the case if the goal is to achieve complete sustainability, as mentioned before. Thus, the interlocking circles better show the model of sustainability where the main three dimensions are integrated and more balanced than in the pillar model. (Adams, 2006)

b) Overlapping Circles

Overlapping circles model of sustainability tries to rectify the flaws of ‘three pillars’ model as it allowed trade-offs between those three dimensions freely. It denotes the fact that the environment reinforces both society and economy. Thus, the environment should be placed as a solid base to well balance all three objectives as shown in the figure below. (Adams, 2006) & (IUCN, 2006).



Figure 3. Overlapping Circles of sustainability (IUCN, 2006)

<http://www.iucn.org/programme/>

2.2 Sustainable Business

“Business sustainability is often defined as managing the triple bottom line as mentioned before– a process by which companies manage their financial, social and environmental risks, obligations and opportunities. These three impacts are sometimes referred to as **3P’s** - profits, people and planet.” (Elkington, 1999).

The ‘greening’ of business has grown to be a central issue in corporate social responsibility for many global companies, although for many it is still a boutique concern within wider relationship management, rather than something that drives structural change in the nature or scale of core business. (Adams, 2006)

2.2.1 History of Sustainable Business concept

Sustainable business, corporate sustainability or sustainability in business concept first emerged in 1972 - United Nations Conference on the Human Environment in Stockholm, where Environmental sustainability was a major theme. The conference undoubtedly suggested that “it was possible to achieve economic growth and industrialization without environmental damage” (Adams, 2006).

The concept further developed later in 1992 - Earth Summit in Rio de Janeiro, organized by Swiss billionaire Stephan Schmidheiny. During the summit, business leaders and 50 leading companies established a Business Council for Sustainable Development to highlight environmental issues (Daniel C. Etsy, 2009, pp. xix, preface), alongside political and economic control (Adams, 2006). The concept of ‘eco-efficiency’ (which was then formed) emphasizes that businesses could potentially benefit from reducing environmental pollution and well managing natural resources. (Daniel C. Etsy, 2009). Almost a decade later, in 2002 - The World Summit on Sustainable Development (WSSD, 2002) was organized in Johannesburg, South Africa to discuss development on aspects such as growing population, quality of life as well as conserving natural resources. Government members, non-governmental organizations (NGOs) and businesses were among the participants. (Daniel C. Etsy, 2009).

One of the most current topics of discussion on environmental matters today globally is The Paris Agreement, which came into force in 2016, Paris, France. The major aim of Paris Agreement is to address climate change by maintaining/reducing global temperature rise below 2 Degree Celsius to and gradually decrease the level up to 1.5 within this century. Currently, the goal is commonly agreed (known as Status of Ratification) by 187 Parties out of 197 Parties to the Convention. (UNFCCC, 2019).

2.2.2 Global Corporate Social Responsibility (CSR)

Global corporate social responsibility comes together with expansion of businesses from local to international level. ‘‘The demand for greater ‘corporate social responsibility’ (CSR) is requiring managers to manage across a broader range of corporate ‘constituencies’ and to be accountable for an array of performance metrics that go beyond profit; e.g., the triple bottom line, stakeholder management, and environmental/sustainability accounting’’ (Elkington, 1999). Corporate responsibility analyses a corporation’s roles and ethics related to shareholders, customers, employees, and suppliers, stakeholders and mainly to societies in which it operates. Multinational corporations face CSR pressure from both local and international level and it is required to function in both sociopolitical and cultural environments simultaneously.

(Devinney, 2011) basically focuses on sociopolitical changes that require organizations to rethink CSR in a broader sense. CSR has become one of the essential strategies to achieve competitive advantage in global space. He explains global CSR pressure in two folds – a combination of ‘objective space’ which is made up of places such the nation- state or recognized institutional structures (such as the EU) and ‘subjective’ space e.g., where the individual or groups of individuals create a sociopolitical space in which they may act without recourse to any existing or identifiable ‘place.’

The pressure for global CSR occurs when there will be gap between these two objective / institutional (e.g., local NGO’s, government, labor unions, environmentalists, human right associations etc.) space and subjective space created by rising global monitors (e.g., WTO, EU regulations, INGOs, ISO standards and now, Paris Climate Agreement). Global CSR pressure includes both local and global level roles and responsibilities of the corporation. At the same time, it is required to balance the internal corporate measures and standards with the global regulatory standards. Global social responsibility requires a corporation to understand the roles of various political, social and economic actors in different institutions as activities of one set of actors influence the outcomes of another set. It also concerns about constructing a uniform monitory democracy. The global standard also encourages building

optimal organizational structures to serve purposes of global CSR standards.

These standards are made functional by changing practices regarding governance, auditing, organizational structures, and codes of conduct as well as setting up clear corporate culture and semiformal organizational rules and routines favoring corporate ethics.

According to Epstein and Roy, 2003 in (Epstein, 2008, p. 37) **Sustainable Corporate Responsibility** includes nine principles of for improving sustainability performance:

1. Ethics
2. Governance
3. Transparency
4. Business Relationships
5. Financial Return
6. Community involvement / economic development
7. Value of products and services
8. Employment practices
9. Protection of the environment

Out of the above nine principles, 1. Ethics, 4. Business Relationships, 7. Value of products and services and 9. Protection of environment would be the focal points of this study in evaluating jewelry business of the case company. These would be analyzed under the triple bottom line.

The concept of product take-back as a part of “**Producer Responsibility** continues to gain popularity and is causing companies to think in life-cycle terms.” It has been introduced by government of various countries or, unions e.g., EU to regulate waste management as well as for recovery of physical products after the end of their life-cycle. (Daniel C. Etsy, 2009, p. 204).

Product take-back schemes occurs due to either

1. Government regulation - imposed by certain entity or,

2. Voluntary action – by companies as part of their sustainability strategy

2.3 Circular Economy – no waste fundamental

Although circular economy as a concept is partially extracted from old times it is currently very present in the discussion about solutions and alternatives for the current linear economical model (Annukka Berg, 2018). The current production and consumption model are based on ever increasing resource use and continuous growth (Ghisellini, 2015). With circular economy's closing-the-loop production patterns within the economic system the efficiency of resource use can be enhanced. The author visualizes the circular economic concept with the following figure, in the context of jewelry business.

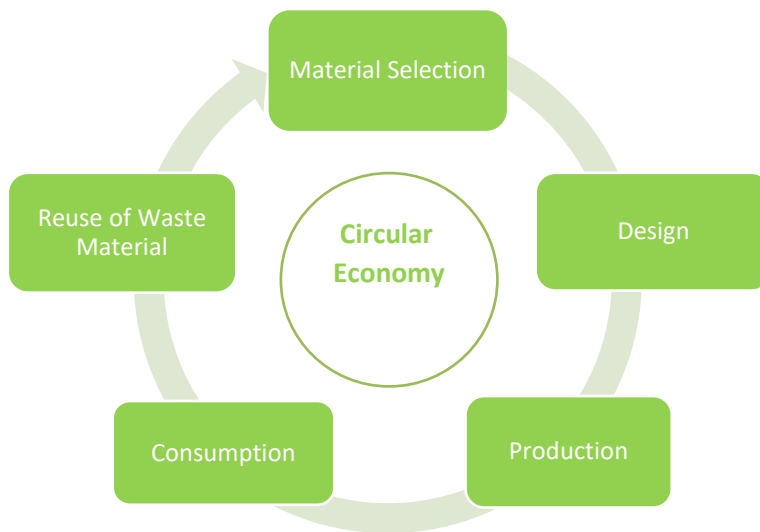


Figure 4. Adapted from the concept of Circular Economy ©

The main aim of CE is to achieve a better harmony between economy, environment and society. This can be achieved by moving into a circular economical model, where material circulates, and waste is reused. (Ghisellini, 2015).

2.3.1 Upcycling

‘Upcycling’ is the most current and trendy term based on the concept of circular economy. The idea of upcycling basically is to re-use the waste materials, by-products or unused items instead of completely crushing them as in disposing or recycling. Upcycling process includes creativity by reusing the end-of-life (EoL) components and waste materials and converts them into a new product of equal or greater degree (McDonough, 2002). Even though in some cases recycling processes could be used to create the same however, upcycling is believed to use less energy and water as it does not require to refine materials to a brand-new state. Meanwhile, recycling usually results in downcycling or downgrading of material’s original state (McDonough, 2002). Thus, upcycling process facilitates extending the lifecycle of those waste materials and components beyond their original intended use., therefore eliminating the need for recycling or disposing at that stage of the loop.

Upcycling aims to re-polish old components or by-products to create various new and more functional products with additional value while remaining in the open-loop cycles. This in other words, is called creating ‘‘additionality’’ (McDonough, 2002), where the process extends product lifecycle and adds value unlike in closed-loop cycles, where old or unused products are either disposed or remanufactured. ‘‘Additionality’’ in this context also means adding benefits to products or methods instead of focusing only on eliminating its negative outcomes. (Nancy M. P. Bocken, 2016) Meanwhile, implementing additionality places spotlight on society’s ‘‘positive footprint’’ instead of ‘‘negative footprint’’.

Historically, upcycling has been considered a secondary function after primary manufacturing due to lack of innovative systems and upstream design process to develop it further. Thus, rather than just turning waste-materials and components into low-quality DIY - like project outcome, upcycling needs to be developed into a systematic and reliable continuous process. To get beyond this second iterative use of materials and for develop a multiple-use system, there needs to be effective exploration into integrated methods for product assemblies (Nancy M. P. Bocken, 2016).

2.3.2 The Principles of Upcycling (Cradle-to-Cradle design)

Upcycling or Cradle-to-cradle products defies end-of-life (EoL) notion and constantly endures the natural system. The opposite of Cradle-to-Cradle or circular products is traditional “cradle-to-grave” or linear products, where products have a limited life-cycle.

Upcycling follows “The Hannover Principles,” design guidelines written in the year 2000 for the World’s Fair in Hannover, Germany and they essentially mention:

- Human beings and nature have right to live, flourish and endure alongside each other
- They are interdependent
- Humans are responsible for designing products that affect both nature and society in either positive or negative manner
- Design has its limitations
- We should create environmentally friendly and reliable products
- Nothing is wasted or thrown away as there is no “away”

Products designed based on these principles fall into two categories:

- **Biological Nutrients:** comprises of items naturally created by the Earth and
- **Technical Nutrients** comprises of materials which are not naturally created by the Earth e.g., metals, plastics etc.

According to this principle, in both the conditions, cradle-to-cradle products are designed and created to maintain the enduring cycle of consumption as well as sustain the planet.

2.3.3 Role of Design in Circular Economy

Circular economy or upcycling principles encourage designers or, people interested in this approach to view everything on “Earth as having potential to be something else”

(McDonough, 2002). Well-thought designs can have zero impact on the Earth as well as correct the past impairment. It is important now to envision new and innovative ways to approach consumption and generate “zero emission” design (McDonough, 2002). To achieve “zero emission”; products, packaging and process should be designed in such a way that they do not produce waste at any stage.

However, the key challenge for designers is to create products that meet this requirement, where products can be reused various times and, also add positive value. Thus, present design should focus on gradual improvement to achieve the goal of circular economy. Whereas, it is also required for designers to re-think product design, choice of materials to be used, performance attributes and EoL strategies. (McDonough, 2002).

Upcycling design is a gradual learning process and designers and people who follow this concept should be given chance to experiment new things. “Often people become so preoccupied with making an object ‘work’ in its first cycle that they don’t look at the next picture.” (McDonough, 2002). Moreover, they should be encouraged to reimagine things they do and explore ways to find additionalities, and to create products, processes and solution that nurture the planet.

2.4 Sustainable Use of Natural Resources in Jewelry Making

“Natural resources are natural assets (raw materials) occurring in nature that can be used for economic production or consumption” (UN, 1997). They can be divided into renewable and non-renewable resources that differ in their ability to regenerate. Renewable natural resources can return to their natural state through natural processes after exploitation. Renewable energy sources for example include solar power generated from sunlight and wind power. Non-renewable natural resources however get exhausted through exploitation and do not regenerate (UN, 1997). Metals come under non-renewable natural resources and thus they do not regenerate after mining. This means new mining sites need to be searched when the previous ones run out of raw materials. This creates an on-going process that can

be partly controlled by recycling the already extracted materials, so new material would not be needed in creating jewelry products.

The production of individual metal is interdependent, as 20% of gold comes from silver and copper mining and 60% of the silver extracted comes from copper, zinc and lead mining. Furthermore, the quality of precious metals depends on the 'ore grade'. Due to over-extraction of metals, the ore grade is gradually decreasing. (Sverdrup, 2014).

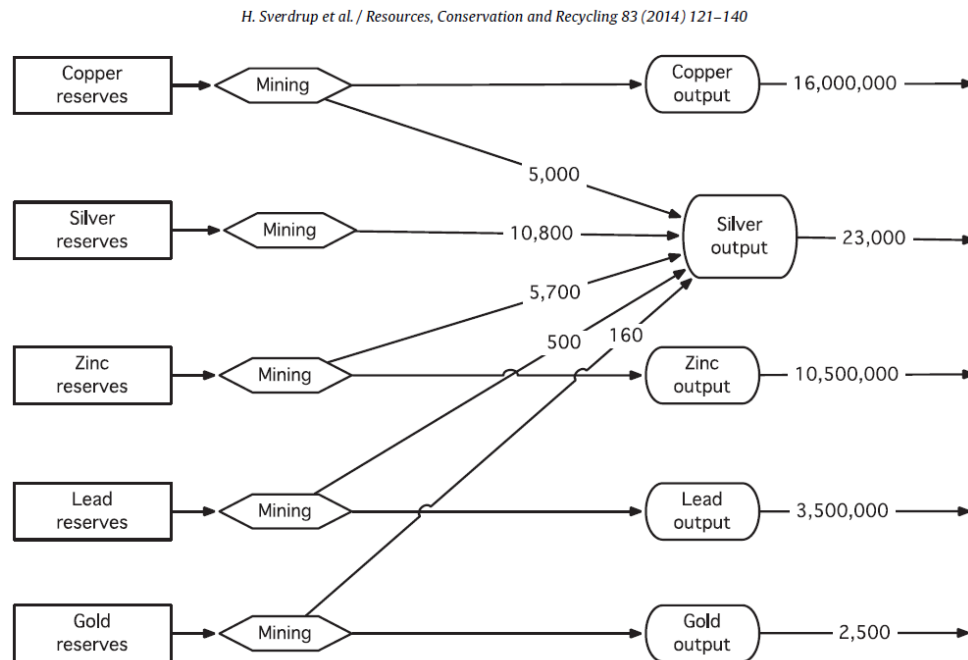


Figure 5. Interdependency of metal production (Sverdrup, 2014)

The global gold production is 2500 tonne/year and the global silver production from mines is an order of magnitude higher or 23,000 tonne/year.

2.4.1 Issues Related to Resource Extraction

Natural resources are the base of every economy, and the current ways of using them create issues to social and environmental sustainability (EU, 2016). The issues in mining material for jewelry products are various. The environmental impacts of mining include damage caused to air, vegetation and forest degradation, surface waters, soil and food crops as well as impacts to human health (Corral, 2009). For example in the case gold mining, the workers as well as resident living nearby the mining sites have been found to be exposed to arsenic and other toxic metals, which causes multiple health hazards (Corral, 2009). Arsenic minerals are associated with gold ore (Corral, 2009) and according to a documentary made by (France24, 2019), to extract 6 grams of gold (Au), 40 kilograms of arsenic (As) gets produced as a by-product. The arsenic then spreads to surrounding ecosystem and through contaminated drinking water and air, to humans causing harmful diseases e.g., cancer. No matter of the scale of mining, it always has negative impacts on the environment, but the method of operating can affect the extent of the impacts. (Corral, 2009).

2.4.2 Current State of Resources and Alternative Stock

As stated in earlier paragraph, it is known that mining is not sustainable on many levels for resource acquiring. It is important now to discover alternative ways to acquire materials for jewelry-production which would be more sustainable. Here, the author has chosen silver as an example to explore the current status of materials stock and where they are located.

The document predicts that after the year 2200, the silver reserves ‘‘will become exhausted and the production decline will be fast and by 2240, all silver mines will be nearly empty and exhausted.’’ (Sverdrup, 2014). Their estimation shows that in 2040, most of the stock should come from recycling and it will be larger than mining.

At present, the estimated recycling rate possibility for silver is 80%, where the missing 20% is either lost or hidden in society. It takes up to 60 years for that 20% silver to come back to the market, before it could be recycled. Thus, with the current available stock, the recycling

rate of silver should be increased up to 95% to achieve sustainable level of silver supply. (Ragnarsdottir KV, 2011). There is a high chance of materials to be entirely lost with the silver-plating process and thus, is not recyclable. Estimation for which is 20,000–40,000 tonne (Sverdrup, 2014). The highest recoverable stock in the society lies in the following forms:

- ***Jewellery, cutlery and personal items of use***

The largest source of silver consumption and the largest stock in society remains / lie in the form of jewelry, cutlery, coins and other personal items e.g., decoration pieces, picture frames etc. People occupy these items from 40 – 80 years in their households after purchasing/owning. These long-occupied and a largest amount of silver take a long time to return to the market as people are emotionally attached to them due to inheritance and other personal reasons. Thus, recycling of silver from this source depends mostly on market price and time. These hidden and privately-owned sources of silver are fully recyclable however, not completely verifiable. (Sverdrup, 2014).

Date	Stock in society, tonne	Global population	Gram silver per person
300 BC	10,000	150,000,000	66
200	40,000	300,000,000	133
800	20,000	300,000,000	67
1490	40,000	300,000,000	134
1550	100,000	400,000,000	250
1720	124,000	600,000,000	206
1840	275,000	1,400,000,000	196
2012	1,271,000	7,200,000,000	162

Figure 6. Estimated Silver Reserve in society as estimated for past times, amounts in tonne, (Jordan, 2011) and (Patterson, 1972) retrieved from (Sverdrup, 2014)

- ***Technical uses - Electronics, household appliances, fuses, film, reflectors, etc.***

Most of the silver lost / missing has been due to usage in electronics and electrical appliances, “and much of this has found its way to landfills.” Silver material waste is up to 50% while being used in this segment. At present, maximum 40% of silver used for this purpose has been recycled and possibly some more could be recovered by creating awareness of recycling possibilities. Estimation 100,000–150,000 tonne. (Sverdrup, 2014).

- ***Investment***

Up to 100,000–200,000 tonne of silver is stored in pure form as investment bars, coins, medals and governmental strategic stocks etc. where, percentage of material loss is zero. In this category, the only driver for return-time to the market is driven by financial logic. “Most actors trade through the metal market, and through trade is geographically dispersed, it is linked through the price systems at the London and New York Metal exchanges.” (Sverdrup, 2014).

2.5 Measuring Sustainability

There have been several methods introduced for measuring sustainability. Out of which the recent ones are Lifestyle Material Footprint (LMF) & Material Input per unit of Service (MIPS) concept by Michael Lettenmeier (Lettenmeier, 2018) to calculate and determine ecological footprints of a certain product/service. The method has been used by some big-scale food and beverage companies recently. However, this method is complex to be used in this context and could be performed by only limited experts in the field.

For this study, it was more relevant and feasible to use Life Cycle Assessment (LCA) and Life Cycle Sustainability Assessment (LCSA) as a base model to analyze sustainability of the case company’s jewelry business for evaluating material, product and process. LCA or,

LCSA practices the major concept of the triple bottom line model, where it provides scores on all three dimensions of sustainability mentioned before (see 2.1.1), while LCA keeps environmental dimension as a key focus for analysis whereas LCSA also includes economic and social dimensions of sustainability. LCA has been used for environmental analysis for this study to obtain information on material sustainability and ethics related to jewelry business whereas, LCSA has been used to analyze product and process optimization while maintaining sustainability.

2.5.1 Life Cycle Assessment (LCA)

LCA is one of the most established tools to manage corporate sustainability for which international standards are available. ISO 14040 defines Life Cycle Assessment as “compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle”. (ISO: Geneva, 2006). Organizations get better understanding of their long-term environmental impact with the help of LCA model. “LCA provides a valuable framework for identifying the total impact of corporation’s activities, process, and products. By examining the impact of products, processes, services, and other activities over the complete life-cycle, managers can redesign these activities to improve sustainability and financial performance.” (Daniel C. Etsy, 2009, p. 204). Meanwhile with LCA, corporations can create a structure to better understand the costs and benefits of its activities. Here, the author has drawn a figure to visualize the LCA concept in order to use it later as a framework to understand the empirical findings and analyze the case company’s value-chain.

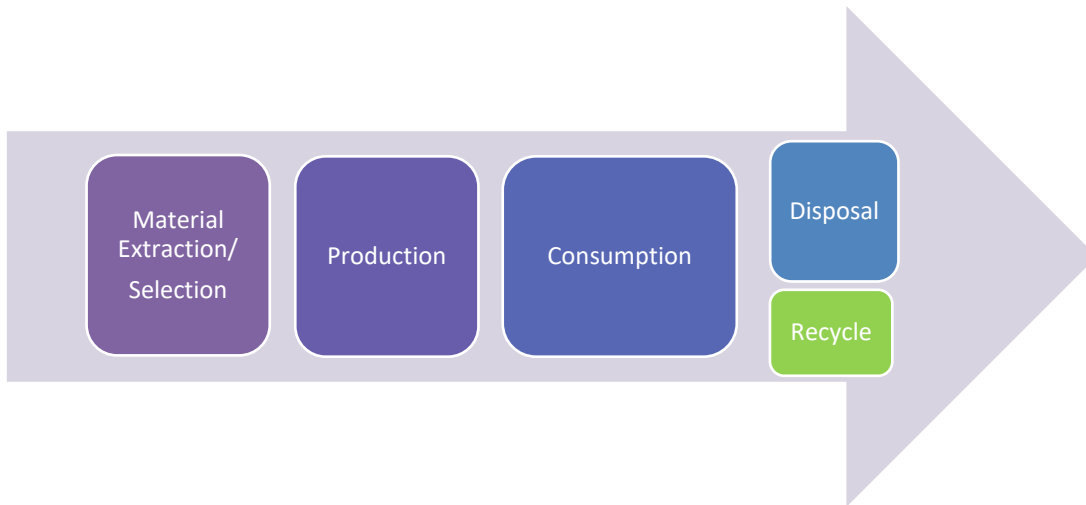


Figure 7. Product Life Cycle, adapted from the concept of LCA (Life Cycle Assessment) ©

This eventually helps improving management decisions ‘e.g., using product life-cycle to understand the impact that its products have on the environment i.e., energy and resource use, recycling and disposal options of products after use etc.’ (Daniel C. Etsy, 2009, p. 205). Life Cycle Assessment includes all components of environmental interventions as it applies the principle of comprehensiveness. (Finkbeiner, et al.).

2.5.2 Life Cycle Sustainability Assessment (LCSA)

The concept of LCSA was introduced to include additional components to measure sustainability performance which LCA did not include i.e., Social & Economic dimensions. The concept of LCSA had been first created by the German Oeko-Institut (Verlag, 1987) as their method named “Product Line Analysis” and later developed by Kloepffer into conceptual formula in 2007. (Finkbeiner, 2010, p. 8).

LCSA supports companies and its value chain members in identifying strengths and weaknesses throughout the entire product life cycle. With the help of LCSA, decision-makers are able to select the most sustainable resources for their products and prioritize them accordingly to enhance positive impacts. It also facilitates sustainable production techniques

and designs. (Anon., 2019). Eventually, LCSA improves the product life cycle (Finkbeiner, 2010) by evaluating corporations based on all three dimensions - environmental, economic and social to assess a complete sustainability (Finkbeiner, 2010).

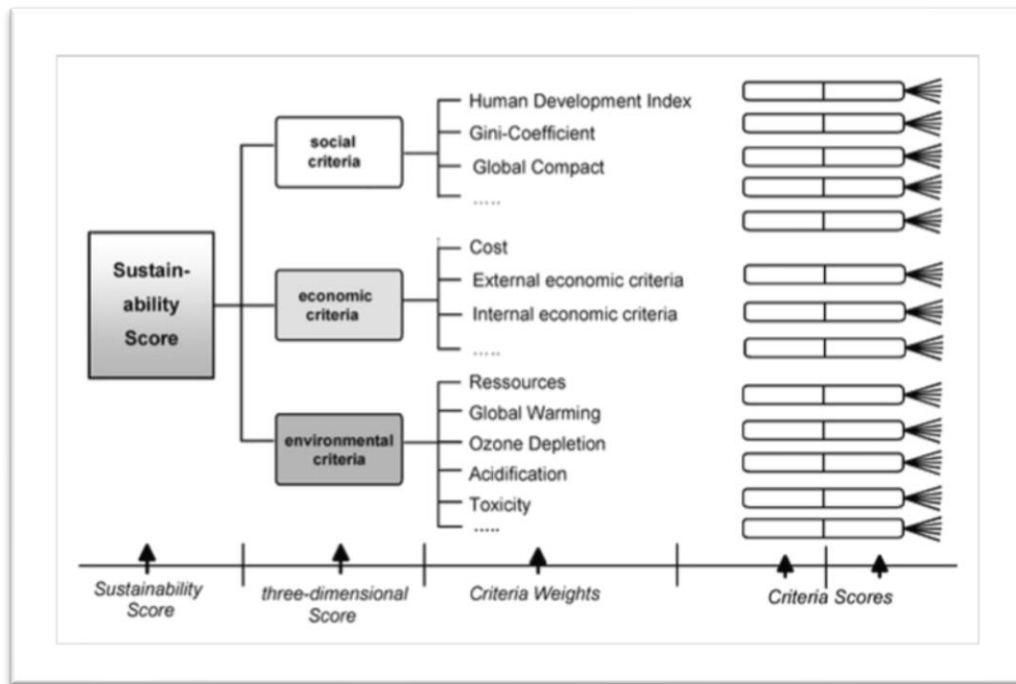


Figure 8. LCSA evaluation scheme addressing all three sustainability dimensions

Source: (Finkbeiner, 2010)

i) Environmental Dimension

As discussed earlier, LCA mainly focuses on environmental dimension and international standards ISO 14040 and 14044 are the basis for performing LCA evaluation. (ISO: Geneva, 2006).

LCA is a holistic environmental assessment tool and it basically includes two major features:

- ***Life cycle perspective:*** It is based on “the cradle to the grave” philosophy of the life cycle of a product. Thus, this concept accesses all the material and energy flows relevant to a certain product/service from their point of materials extraction, processing, production to further processing, distribution, final consumption, recycling and disposal.

- ***Cross-media environmental approach:*** It accesses all relevant environmental impacts of a certain product/service i.e., “both on the input side (use of resources) and on the output side (emissions to air, water and soil, including waste).” (ISO: Geneva, 2006).

Environmental interests in terms of sustainable business refer to the company’s effort in reducing its negative impacts on the environment and maximizing effort in preserving the nature. The sustainable firm constantly contributes in optimizing the use of natural resources by practicing the use of renewable materials and green energy while minimizing environmental hazards. Many sustainable firms also invest in technology and re-think their design to enhance efficiency and to promote greener future. Moreover, sustainable firms consider all the possible impacts of their value-chain activities on the natural environment and make decisions accordingly. (Cavusgil, 2012, p. 166).

ii) Social Dimension

The social dimension of sustainability analyzes the impact of an organization, product and process on society where it operates. The cause and effects of a firm’s activities on society / stakeholders can be measured at local, national and global scale (GRI, 2002). These effects are however not easy to quantify. Thus, the social indicators are mostly based on qualitative measurement system relevant to specific line of business and, works alongside other two dimensions of sustainability i.e., economy and environment i.e., Gross Domestic Product (GDP), Human Development Index (HDI), Infrastructure, Health and welfare expenses in percentage of GDP, Human Freedom Index (HFI). (Finkbeiner, 2010). Without the economic

and environmental resources, it is not possible to assure the quality of life for the society (McKenzie, 2004).

The sustainable firm ensures to provide a sound working environment, labor rights, health and retirement benefits, diversity in hiring as well as training and educational opportunities to its employees. On the other hand, the firm thoroughly examines the activities of its value-chain for the safety, security and betterment of the societies concerning the business. (Cavusgil, 2012, p. 166). Above all, firms should be aware of legislation protection of people's health arising from negative impacts of the firms' activities e.g., pollution, toxicity etc. (Adams, 2006).

iii) Economic Dimension

Economic dimension of LCSA basically calculates the cost and performance of a certain project. There are several approaches available for the economic evaluation, which usually considers "manufacturing costs (from a business perspective) and life cycle costs (from the customer's perspective)" (Finkbeiner, et al., 2006). The life cycle costs includes the total costs of a product manufactured over a certain life time (Kaufman, 1970). From the development perspective, economic development means providing general people what they need without compromising the quality of life by eventually reducing financial burden and bureaucracy (Adams, 2006).

Economic sustainability means to ensure sound economic growth alongside unlimited consumption, while considering the nature's limitations. Economic interest in sustainable business refers to a firm's effort to economically develop localities where it functions, in terms of tax contribution, job creation, providing fair-wages, supporting disadvantaged communities, improving living standard etc. (Cavusgil, 2012, p. 166)

3 METHODOLOGY AND DATA COLLECTION

This chapter provides details of the research method, data collection and analysis technique applied for this study. The map below provides a visual structure for the same.

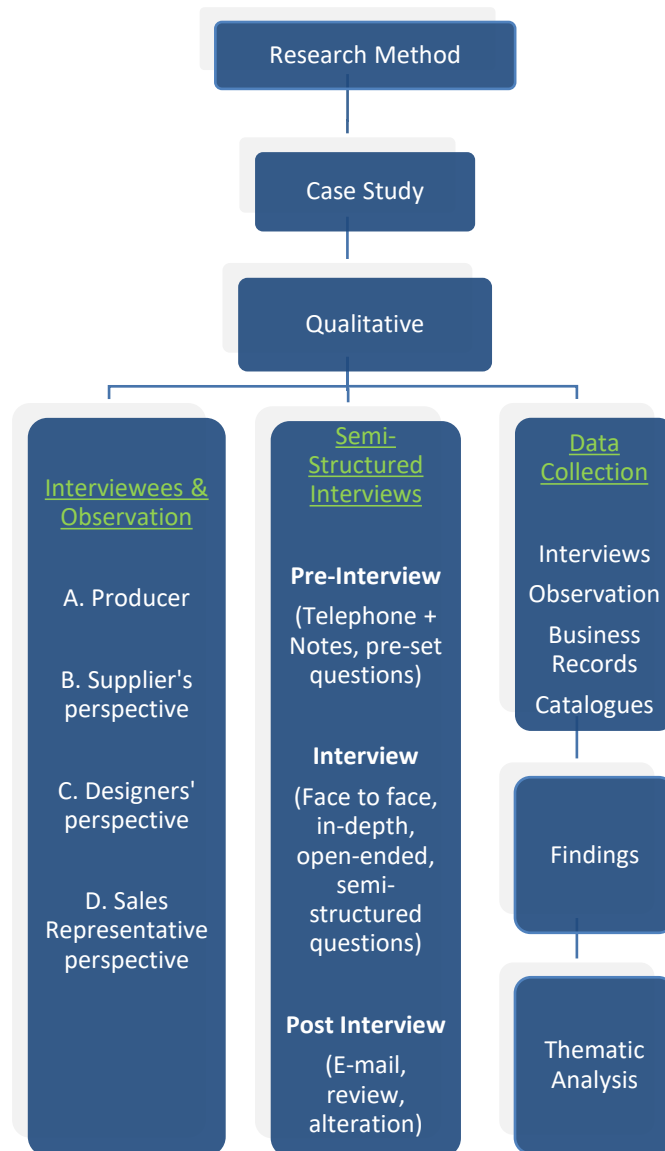


Figure 9. Research Map

3.1 Research Method

This research is a case study focused on developing a sustainability plan for the case company's jewelry business unit. The case study approach has been preferred for this research, as it is a popular and widely used method in business research (Eisenhardt, 2007) focusing on a single case and single organization (Bryman, 2011) :59-60. "The basic case study entails the detailed and intensive analysis of a single case" (Stake, 1995) and, this research aims to analyze sustainability related to jewelry industry in depth. Furthermore, this research focuses on answering the main research question consisting "How" in a contemporary setting (Yin, 2003) :2.

Besides analyzing the chosen case, the purpose is also to understand various sustainability models as (Stake, 1995) suggests "the selection of cases should be based first and foremost on the anticipation of the opportunity to learn." Along with the learnt literature, this case study follows an inductive approach to form a relationship between theory and research (Bryman, 2011): 60. Formation of theory prior to the collection of any case study data is an essential step in doing case studies (Yin, 2003) :28-29.

3.2 Data Collection

The primary intention of data collection is to collect adequate evidence to support the research questions for this study. To conduct this case study, the author has chosen qualitative method for data collection even though (EISENHARDT, 1989, pp.534-535; YIN, 1981, p.58) suggests that case studies can be done using either qualitative or quantitative evidence (or mixed method). The case study design often favors qualitative methods, and this study explores the case through qualitative data collection methods such as semi-structured interviewing and participant observation. These methods are particularly helpful for acquiring comprehensive details and understanding of the case (Bryman, 2011):60-61. Research problems concentrating on uncovering a person's experience or behavior, or where we want to uncover and understand a phenomenon about which little is known usually adopts qualitative method (Grønhaug, 2002):87. The case study enables combination of several

qualitative methods, “thereby avoiding too great reliance on one single approach.” and enhances data credibility. (Bryman, 2011, pp. 60-61) .

According to (Yin, 2003, p. 83) there are six possible sources of evidence for case studies: documents, archival records, interviews, direct observation, participant-observation, and physical artifacts. For this research, evidence was primarily collected through interviews and participant-observation while, company’s archival records and catalogues have been used for background information. Other data sources mentioned here were not applicable for this case.

3.2.1 Qualitative Interviews

The primary tool for collecting empirical data for this research had been qualitative in-depth interviews. It included semi-structured and open-ended questions to get unbiased response from interviewees, in the meantime staying within the topic area. Open-ended interviews are one of the most important information sources of case study, in which key respondents could be interviewed to collect “the facts of a matter as well as their opinions about events” (Yin, 2003, p. 90).

“The intensive study by ethnography or qualitative interviewing of a single case, which may be an organization, a group of employees within an organization or an individual.” (Bryman, 2011).

It includes three face-to-face interviews and two video-interview techniques with case company’s experts in the field, which would be described later under ‘background of participants.

3.2.2 The Research Process

Interview guide consisting of 25 questions had been prepared based on the research problem of this study. Each question was divided into 4 categories to get relevant answers. The

interview guide had been then emailed in advance to the interview participants along with a brief description of aim of the interview. The interviewees were given choice of location and time according to their schedule as it gave them flexibility. It included the case company's inhouse as well as external participants. 3 face-to-face interviews were conducted in the United States and in Finland simultaneously. And, a video-assisted interview was chosen for supplier to save time. The pattern of interview was conversational type to provide flow to responses. This method also helped to understand and interpret phenomena in natural settings (Denzin, 2000, p. 3)

All the interviews were conducted in English except for one with supplier (which was later translated into English while transcribing). The duration of each interview was about 60-70 minutes depending on the situation. During the interview the author collected notes of important answers and, all the interviews were fully audio-recorded for double confirmation. Later the answers had been transcribed into a structure and follow up questions were asked for validation. With the aim to keep the interviewees identities anonymous, the author has categorized them according to their designations or, their relationship to the case company.

3.2.3 Background of Participants

- *Producer* – The producer here, is the one who looks after overall business operations and has an important role in supply-chain. It includes decision-making of purchasing raw materials, manufacturing to selling the final products. It was important to interview the producer to understand how the production and process is executed and the current status of sustainability in the case company. Experience in the field is 20+ years.
- *Supplier* – The supplier here is the external producer of jewelry and packaging for the case company. Part of the production of the case company has been outsourced / partnered to produce thorough these suppliers. The supplier's perspective provides another angle to observe cost and resource sustainability. They have been working together with the case company since last 5 years.

- *Designers* – There are two designers included in this research – first one is in-house (*Designer 1*) and the second one, a free-lance Nordic designer/artist (*Designer 2*). Interviews with the designers depict the role of design in material and process efficiency of jewelry-making.
- *Sales Representative* – Sales people are important medium to interact with retail customers and know their requirements. Interview with sales representative gives perspective on current trends and helps product and service improvement.

3.2.4 Participant Observation

Participant observation is one of the most common processes of qualitative data collection. It enables the observant to learn and understand activities of a case in a natural setting. However, participant observation method could be very demanding and time-consuming as it requires the researcher to become a participant in those activities / the case to be studied (DeWalt, 2002). It requires the researcher to learn thorough exposure and involvement in the everyday activities of the participants in the case-company (Schensul & Schensul, 1999, p. 91). As the researcher here is associated with the case company, it was easier to get access to observation targets. Here, the data has been collected as field-notes through observation of the overall activities and experience of the researcher in the case company. The aim of combining participant observation with the interviews in this research, is to get unbiased, precise and holistic understanding of the case (DeWalt, 2002, p. 92).

3.3 Validity and Reliability

Validity and reliability is not used in the same manner in qualitative research as in quantitative. Since reliability is usually related to measurement, it is irrelevant in qualitative

research (Stenbacka 2001) in (Bryman, 2011). Instead, reliability is a result of validity in a research which depends on the researcher's ability and skills. To enhance validity in this study, transcription of interviews had been shared with the participants for reviewing, as sharing the findings can be a valuable part of the analysis. Respondent validation also is an effective way to ensure the accuracy of correspondence between the qualitative researcher's interpretation of findings and research participants perspectives and experiences. (Bryman, 2011, p. 396). This way, research participants are able to clarify the interpretation as well as provide additional perspective to the research matter.

Multiple methods including interviews observation, field notes and recordings were used to create more "valid, reliable and diverse construction of realities" (Golafshani, 2003).

3.4 Data Analysis

Data analysis phase is an integral part of research and it requires the researcher to carefully place the answers into more concrete form. According to (Yin, 2003, p. 109) data analysis consists of "examining, categorizing, tabulating, testing, or otherwise recombining both quantitative and qualitative evidence to address the initial propositions of a study". Since this research applies only qualitative evidence, the author has chosen to conduct thematic analysis.

3.4.1 Thematic Analysis

Research based on qualitative evidence mostly creates a large amount of database due to its nature of data collection method (also used in this research) e.g., semi-structured interview transcripts, observation, field notes, documents etc. It would have been difficult to analyze this sort of data without having a thematic categorization. Thematic analysis is one of the most common ways of conducting qualitative data analysis. (Bryman, 2011, p. 571).

Here, first the interview guide was prepared based on research questions of this study while considering key points from the literature review. The major idea of theory-guided analysis is to compare and complement interpretations of empirical data with secondary data within the scope of the study (Kohlbacher, 2006). Later, the answers/findings were placed under relevant themes during the transcribing process. The thematic process made it easier to analyze enormous database and get rid of excessive data which was not necessary for this study. It also helped to identify additional themes which was important to understand the case. Secondly, the author returned to the study purpose to examine if the answers corresponded to the research questions. This way, the analysis tend to be more focused and consistent while limiting the research to go outside the scope of this case study (Yin, 2003). The purpose of a case study is to ensure that all findings are presented holistically so as to understand the overall case. (Baxter, 2008). Thus, all the data gathered for this study via interviews, observations and records have been combined together for analysis.

4 FINDINGS

Here, the findings from qualitative interviews conducted with the case company's management team, producer, designers, supplier and sales representative as well as observation results are presented holistically. The major models chosen for analysis are Life Cycle Sustainability Assessment (LCSA) and the concept of Circular Economy (CE), which had been described earlier in the literature review part. Under LCSA model all three dimensions have been analyzed by providing sub-headings for further clarification of the findings. Circular economy concept has been used to analyze the case company's product life-cycle, the process, recyclability and reusability of materials etc., and to find solutions accordingly, which will be further presented in the discussion and managerial implication sections.

4.1 Life Cycle Sustainability Assessment (LCSA)

4.1.1 Environmental Dimension

All the answers from qualitative interviews and observation results are placed under the concept of LCA, which specifically helps to analyse the environmental dimension of sustainability of the case company's jewelry business. It includes analysis of the business process throughout the whole product life cycle - *Life cycle perspective* as well as its potential impact on the environment - *Cross-media environmental approach*.

a. Resource acquiring

The producers usually purchase the main material i.e., Gold and Silver directly from banks in raw form, in blocks. They prefer banks as their major suppliers for raw-material as the materials from banks *'are pure and we get them in international market price whereas, if materials are brought by customers or, local agents for resale those need to be checked and verified before purchasing.* ' – Producer

Suppliers get their raw-materials from banks as well as other sources, they have also used old materials as they have in-house unit to purify. They have used second-hand materials from the local jewelry shops and also from customers at times. Both the producer and supplier does not seem to be aware and concerned about the scarcity of resources. *“We have been easily getting materials until now... have not thought about the shortage, not sure if there is going to be shortage in the near future?” - Supplier*

According to online observation, one of the new trends to acquire second-hand materials is to contact electronics disposal places, where precious materials like gold and silver could be found in old/disposed computer chips.

b. Materials Efficiency

The most popular materials for jewellery production are gold, silver and semi-precious stones (e.g., amethyst, aquamarine, topaz, ruby, coral etc.). Out of which, the most durable as well as flexible materials are gold and silver whereas, the least durable out of them is semi-precious stones. *Gold and silver are also very flexible materials to use because we can change it into any shape we want without too much difficulty like when changing stones' shapes. They don't break like other materials (Supplier, 2019).* Mostly gold with diamond combinations are preferred by customers for special occasions like engagements and weddings when they are also usually the most expensive materials in this category. *“We like to work with gold and we also prefer to trade gold items the most and, the second-best material would be silver for similar reasons. It is because when we buy and sell it, it does not lose its market value.” Diamond loses its value as soon as it gets scratches and marks and semi-precious stones can crack or break with time. (Producer, 2019).* However, if gold is used in its purest form i.e., 24 carats would be too soft in nature and jewelries consisting pure gold can be easily bent and go out of shape soon. That is why producers usually try to avoid using the purest forms of materials for production and

would rather transform them in to lower carats for jewelry-making e.g., 18, 14 carats etc to maintain durability of products.

When enquired the supplier about the amount of material waste (while molding a new piece of jewelry) in percentage, it was discovered that gold loses *“about one to two percentage while melting multiple times and for molding it depends on designs.”* (Supplier, 2019)

The most preferred materials for the freelance designer are silver, ceramics, wood and food, out of which silver tops the list while considering jewellery-making. The freelance designer has been also experimenting with alternative materials. *“Positive side of Silver is its easy material, durable. Not too hard, even though not as soft as gold. Silver is more affordable than other precious metals too. You can do small things which is more difficult with for example glass, stones and so on. It is easier to shape it in any forms and looks nice. Negative side is its ethical reasons related to mining.”* (Designer 2, 2019)

c. Energy efficiency

Choice of energy for production and operation, observation around the firm including electricity, machinery, technology etc. suggest that the firm could transform their energy source into more renewable sources e.g. solar energy. Clean energy is partially used by the firm even if it costs slightly higher. *“It is possible to fully us if the market rate of clean energy like solar and wind gets cheaper in the future and are easily available in this region.”* (Supplier, 2019). Installing own roof solar panels are also an option and could be cheaper in the future. They are using hybrid cars for now and considering electric cars as the system to recharge improves and when auto industry brings out designs that suit their current need, and more after sales support is available.

d. Packaging

Previously, packaging for jewelry consisted plastic boxes with metal locks and velvet lining. Currently, various hard paper boxes wrapped with velvet are used for packaging. Most of the packaging for jewelry are now made from ecological materials. The packaging has also been changed into light-weight velvet bags ‘*to save space for travelers.*’ (Sales Representative, 2019).

4.1.2 Economic Dimension

Economic dimension considers manufacturing costs (from a business perspective) and life cycle costs (from the customer’s perspective) as well as the business’s impact on the society where it operates.

a. Cost Efficiency (Business Perspective)

While gold and silver are treated as stocks, also while re-purchasing old jewelry the price depends on the market rate during that particular time and its quality. (Supplier, 2019)

From the (Designer 2, 2019)’s perspective, it is more efficient to use ‘*sheet of silver, 1-2 mm*’, which is cheaper and more flexible to use, also it can be effortlessly cut and rolled depending on purpose. These forms of materials are mostly used for hand-made jewelry.

If a customer wants to sell their old jewelry, the resale value usually depends on the type of jewelry and, the depreciation reduced form those items are usually ‘*2-10% from gold and silver, and 10-15% from diamond simultaneously.*’

b. Value of products & services (Customer's perspective)

“Customer prefer gold more and, its resale value does not decrease much except of making charge and wastages.” (Producer, 2019). According to (Sales Representative, 2019), quality of materials used for jewelry is very important for customer satisfaction and it also assures its return value and reuse purposes. There are many measurements used by the company e.g., 92.5 sterling silver, GIS certification for diamond to certify the quality of materials.

Consumers usually come to fix their jewelry. Some of them have asked if they can remold their old jewelry while the others might not have thought about possibility to do so. Yeah, they might be interested if the service is provided with more affordable fee to our regular customers. (Sales Representative, 2019. There is a repair service available at the stores however, the service process or cost has not been clearly communicated to customers.

c. Design and Technology

According to the producer, the handmade designs are preferred over machine-made as amount of material wastage can be reduced by using manual tools. On the other hand, this process also saves energy. On the flip side, the manual process is lengthy and time it consumes for production is inconsistent. *Yes, it would be useful if we could combine manual process with machine if it could create similar kind of outcome. (Designer 1, 2019).*

The designers mostly prefer to make simple designs and work manually, *‘touch and feel of the materials with hands is important’* for them. Technologies e.g., laser-cutter for glass *‘feels foreign’* (Designer 2, 2019). The (Designer 2, 2019) believes that they might get familiar to functionality of new technologies if they get opportunity to learn the process.

New technologies i.e., 3D printing was not preferred by the external designer as it is not technique-oriented or visually appealing, they believe *“it must be shape/aesthetic oriented.”* 3D printers could be used to create shapes which would be difficult and time-consuming to create by hands effectively. (Designer 1, 2019).

4.1.3 Social Dimension

Social dimension here includes the impact of an organization’s product and process on their internal and external environment and the efforts made by them to improve the condition.

a. Impacts of Mining (Ethics)

“We have seen some TV programs and news where they show the negative side of mining industry. I have seen one with diamond but have not gotten chance to watch others so, I must say I don’t have enough knowledge on that side. Plus, we usually get our raw materials directly from banks and some finished products from the suppliers so, thought it might not link us directly to those issues” (Producer, 2019).

Yes, of course I have been following these environmental and social issues related to mining industry through documentaries and social media. I have always been concerned about it specially about ethics – working conditions, health and safety of those miners, how much they are paid – is it fair etc.” – (Designer 2, 2019)

According to the (Sales Representative, 2019) most of the customers do not enquire about the origin of products. They usually ask about the quality of diamond and gold and ask for quality certification. *I guess they mostly pay attention to nice and unique designs.*

b. Employer Responsibility

The company have a multicultural team working in different departments and they get design ideas from various parts of the world. *Our designers are from various countries bringing diverse ideas to the table. We usually try to include aspiring artists. (Producer, 2019).* The company and its suppliers validate that the employees are fairly-paid and the working environment is healthy. On the other hand, in this business it is important to make sure there are no IPR (Intellectual Property Rights) issues when it comes to design and the company makes sure to patent the designs as soon as they have been confirmed.

c. Corporate Social Responsibility

According to the producer, they try to support the local community by providing them training and support by involving them in production of packaging. It creates work-opportunity for disadvantaged community as well as improves their skills and capability. *We have been collaborating with NGOs and charity organizations to provide necessary support to the local people. Our next step is to operate community forest program to boost the environment and locals living around it. (Producer, 2019)*

4.2 Circular Economy & Design

a. Product, Process and Service Activities

We can give example of gold: first we *purchase the raw gold from banks, then we change its purity as per the design requirement, designs are made, settings are done and are made ready for buyers. (Supplier, 2019).* Here, changing purity means to turn gold into various carats from 24 carat to most used levels which are 18 and 14 carats.

The typical process (‘Cradle-to-grave’ cycle) of jewelry production is as follows:

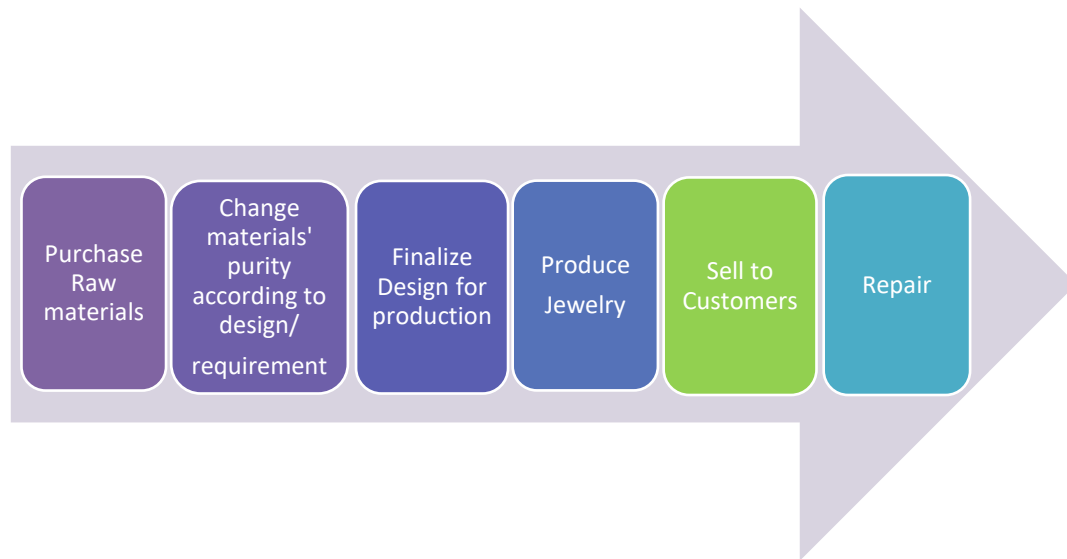


Figure 10. Case company's precious metal-jewelry life cycle based on LCA model (Cradle to Grave) ©

In order to make a new piece of jewelry, the producers usually prefer to use raw gold or silver. If customers provide their old jewelry, it is refined back to ‘raw form’ /crude metal again. Precious stones and semi-precious used for production does not require changing into various level of purity as their quality is already fixed during extraction/mining (Silver, Zinc etc.).

e. Repairing, Recycling and Reusing

The company has repair service which is free of cost for its customers up to a year, then after applicable fees will be charged. Recycling in jewelry business usually means to either repair the old jewelry or, to reuse them by completely refining (melting and processing) old jewelry to its crude form to create a new design. ‘‘Refining works are done by specialists mixing other materials to remove impurities.’’ (Supplier, 2019). The most recyclable materials are gold and silver,

whereas semi-precious stones are very delicate to be recycled efficiently. Gold and silver can also be recycled and reused multiple times. *To remake, gold and silver are transformed to raw form again and it follows the same process as making from raw material. (Producer, 2019).*

According to of the designers, the ‘waste’ part of metal like silver and gold is collected by the studio to be reused. Thus, *‘metal is the most reusable material in jewellery-making.’* According to (Designer 2, 2019), the issue with most of the recycled materials is that *‘they look raw - not very sophisticated’*.

Customers would not mind buying second-hand jewelry if they could get them for cheaper prices than the price of new. *Also, the style has to be as per their taste. They usually question about the quality too. Yes, they might like it better if they had an option to re-make a new style out of their own old jewelries. ’* (Sales Representative). They will be more concerned about the re-making fees and material loss.

‘‘ Yes, we have a few second-hand jewelry at stores but, some of them remain on the display-shelves for a long time. Old pendants and chains have been sold while, mostly wedding-rings are preferred brand new.’’ (Producer, 2019) The reason for this could be personalization, individuality and emotional values attached to it. Also, the concept of using it for the long-run as well as on a daily basis so, the size, color, shape and design also has to be accurate when it comes to engagement / wedding rings. These are also the items which do not stay idle or unused and serve the full usability.

b. Upcycling, Design and Alternative materials

The challenges in reusing the old jewelry is that *‘refining takes time and those works needs to be carried out by the specialists.’* This process also reduces the weight of old jewelry during the *‘purification’* process. (Producer, 2019).

Upcycling of old design or metal is possible. It is *easier to do so if the metal is 'refined back to its raw form.'* However, it could be more difficult to upcycle directly from the old product *'due to hardness of metal in that form.'* When it comes to precious stones, we have to be more careful while detaching it from the original frame without breaking it.' (Supplier, 2019).

Other materials for upcycled jewellery example, Glass waste and cuts collected from factory have been used to create upcycled jewellery e.g., finger rings with combined with silver, pendant etc. The drawback of using glass is it causes extra effort while reusing as it needs higher temperature for melting (that means more energy use) and it somehow becomes stiffer'. (Designer 1 & 2, 2019).

Old paper magazines are also one of the materials upcycled to make colourful earrings combined with silver hoop. The issue with paper is that *'it is very fragile material and when I use magazines pages to make jewelry, I usually make up to 20 pairs of earrings at once, otherwise making individual piece at a time does not feel worthwhile'.* (Designer 2, 2019)

Other new materials which the designers have been experimented for upcycled jewellery are dried fruits e.g., organic oranges, lemon etc. However, they might not be durable as *'they react to humidity'*. The plus point is their nature of biodegradability and use of less resources as well as easier to replace without degrading the nature/environment. *Tin could be also used to replace precious metals however, it is softer than silver/gold* (Designer 2, 2019).

According to designers, besides consistency another factor contributing to eco-efficiency in jewelry production is design. Simple or minimalist designs takes less time, create less wastage and are easier to re-make in contrast to complex designs with many details.

5 DISCUSSION

The major objective of this study was to understand how sustainability can be integrated into jewelry business of the case company. In other words, this study explored the ways to make the case company's jewelry business more sustainable by comparing the literature review and the empirical results. The discussion section will reflect on the findings and answer research questions accordingly. Additional information discovered during the research from interview answers as well as observation results relevant to the study would be also included here.

The most viable sustainable models available for this case was Life Cycle Sustainability Assessment (LCSA) with major ideas from the most popular sustainable development theory – the triple bottom line to analyze the potential impacts internal and external environment of the case company's jewelry business. Under which, this research explored the sustainable solutions to integrate into the jewelry business by finding out the best use of resources and alternative sources of raw-materials for jewelry production supporting the Circular Economy (CE) concept.

How can we measure sustainability and ethics of jewelry business?

5.1 Industry Analysis – LCSA Evaluation

Here, the findings from the empirical part would be further evaluated and discussed focusing on all three dimensions of sustainability by using LCSA chart. It will reveal the case company's internal and external environment and its effect on these dimensions. "Identifying the impacts created by an industry can aid in the development and implementation of a sustainability strategy" (Epstein, 2008, p. 28). LCSA helps in identifying the potential issues regarding the jewelry business and suggest solutions for them accordingly. Internal environment here consists of firm's internal operating environment – production facility, administration, distribution and sales units, products and packaging and after sales activities. External environment includes, origin of resources – impact of mining

activities, supplier activities and their impact on the landscape and environmental quality and society.

5.1.1 Impacts of Jewelry Industry

Major environmental and social issues related to the case company's jewelry business usually comes from external environment i.e., mining and processing. The research shows (see Fig. 10) that the starting point of the case company's life-cycle is to acquire materials to produce jewelry i.e., precious metal (Gold and Silver), precious stones (Diamond and Sapphire) and semi-precious stones (amethyst, topaz, ruby etc.). According to the results of interviews and observation, the producer and suppliers of jewelry are not fully aware of the impact of their external environment as most of the resource needed for the jewelry production has been acquired from either banks or, from other similar sources. They are not directly involved in the mining and extraction of resources. However, LCSA suggest that the company should consider all the direct and indirect factors considering the business. Even though the producer and supplier acquires the materials through the indirect sources i.e., banks, local providers, it is important to get certification of quality as well as ethics.

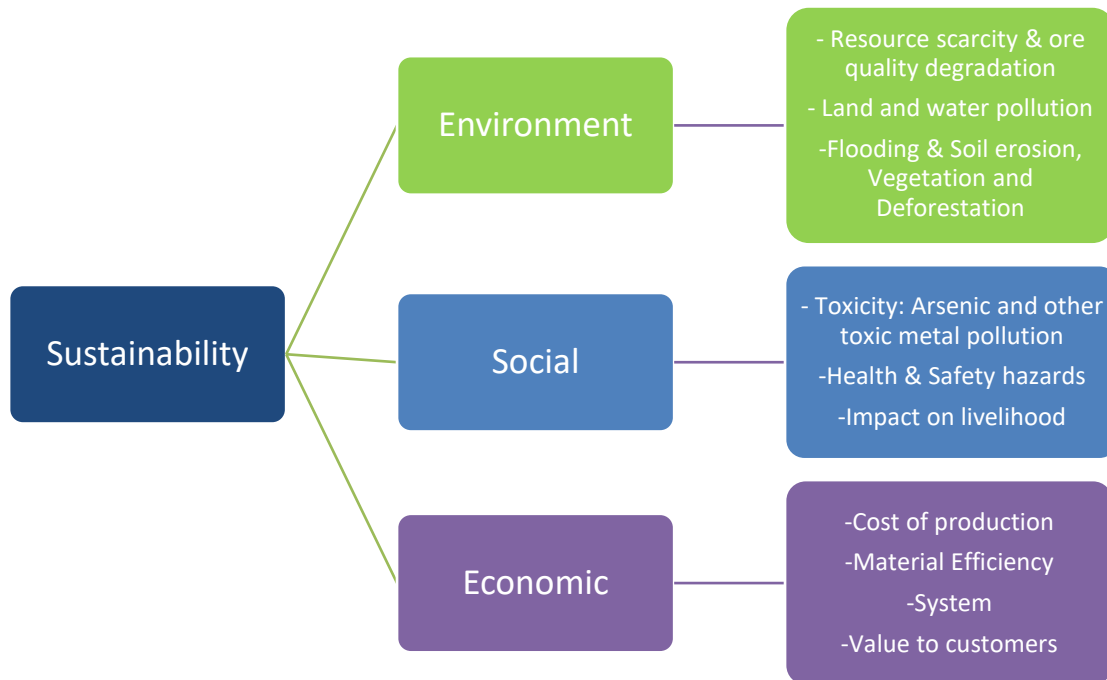


Figure 11. LCSA evaluation of the case-company adapted from (Finkbeiner, 2010)

As mentioned earlier in the ‘literature review 2.4’, mining causes environmental and social issues and especially, the jewelry industry-related mining causes toxic metal poisoning leading to land and water pollution (Corral, 2009). This leads to major environmental issues e.g., soil erosion, flooding which impacts livelihood of society around the mining area. Scientists have suggested that these issues are almost permanent as it takes a long time for the land to come back to its original state as well as to remove toxicity in water (France24, 2019). Alongside, serious health hazards e.g., skin cancer, respiratory issues have been noted to arise from mining-sites (Corral, 2009). As more and more precious metals and stones are extracted from mining, it lowers the ‘ore grade’ (Sverdrup, 2014) which is considered important to maintain quality of materials used in the jewelry business. The supplier think that there are also positive sides to mining as it creates jobs in the locality and improves infrastructure e.g., building new road creates accessibility to those remote areas. It is important to prioritize the values, which would be beneficial to the company in the long-run. In order to avoid the possible ethical issues, the case company should examine the activities of its value-chain (Cavusgil, 2012, p. 166) and, comply to legislations regarding those

activities for the protection of health, security and betterment the society and the environment (Adams, 2006).

Which materials are the most sustainable for product and packaging?

5.1.2 Resource Efficiency and Sufficiency

This research shows that gold and silver are the most durable, recyclable and reusable materials due to consistency and flexibility while semi-precious stones tend to break while recycling. Out of all, gold and silver fulfils the criteria of the ‘cradle-to-cradle’ concept as they can be reused multiple times without causing excessive waste. Gold, silver and diamond are also preferred by consumers due to its exquisiteness as well as resale value.

As per the study, metals come under non-renewable natural resources and get exhausted through exploitation and do not regenerate (UN, 1997). The amount of silver and gold (which are the main materials for this case) in the nature is gradually declining and is expected to go extinct by 2240 (Sverdrup, 2014) and by 2040, most of the stock for silver/gold should come from recycling and it will be larger than mining. However, the case company did not seem to be aware of resource scarcity as there has been very less discussion about the resource use and over-extraction over media. The situation is slowly changing now, and some documentaries have already been made by scientists in the field. Thus, it is better to plan ahead before it becomes a huge issue and, start reusing as a base source of acquiring materials.

5.1.3 Packaging

Most of the businesses are changing their packaging materials from plastic to other more eco-friendly materials as plastic-waste has been discussed as one of the biggest climate-polluter alongside CO₂ emission. It has been widely discussed over media as well as in politics.

According to the analysis, of the case-company is already ahead in eco-packaging. They had been using materials like paper and cloth for their packaging boxes and bags since last 5 years and are looking for more durable options now. The further sustainable options would be to create a system where the company re-purchases the packaging which are in good state from customers in order to use them again for the next customers. This could provide extra value to customers and also could be economic option for the business.

5.1.4 Process / System

The observation of the case company's process/system shows that the company currently comes under cradle-to-grave or linear system. It starts by acquiring material and ends with final sales/distribution to customer. The after-sales service only includes repairing and not reusing. As for production, the main producer uses hand-made or, manual method of jewelry-making which is 99% energy-efficient and uses lights only during the dark-hours. On the other hand, the supplier uses both manual as well as machinery for jewelry production. Machinery used for jewelry production uses energy e.g., laser-cutter however, the process is faster than manual method. Thus, combining both the methods could bring out more efficient results if source of energy is clean/ecological e.g., use of wind and solar energy. Besides, taking advantage of new technologies like 3D printing could be beneficial for material efficiency, design, customization, and process optimization.

What are the most sustainable ways to acquire resources for jewelry business?

5.1.5 Quality Certification

Quality certification is an important method to find out the grade of materials used in jewelry-making and the case-company uses them to certify their gold, silver and diamond in terms of

carat and GIA (Gemological Institute of America) certifications however, they still lack enough certification on environmental and ethical context. Most of the jewelry consumers usually enquire about the quality and price of the jewelry according to this research. They do not seem to be excessively concerned about certification or labeling required to evaluate environmental and social ethics e.g., fair trade certification, eco-levels etc., when it comes to jewelry business. It could be because there has not been enough media coverage regarding issues concerning jewelry industry as much as in clothing industry. Only those consumers who are more environmentally or ethically aware tend to seek details of background e.g., where and how the products have been produced, what kind of materials have been used – organic, ecological, ethical, recycled or not etc. It could be presumed that due to current climate change and ethical movement, these questions are expected to rise in jewelry business in the near future.

5.1.6 Sustainable Method of Acquiring materials

“Human Rights Watch released a report in early 2018 scrutinizing 13 major jewelry brands. None of them fulfilled all the criteria for responsible sourcing, and only one – Tiffany & Co. – had taken significant steps. However, nearly all of them acknowledged their responsibilities and have made some efforts to responsibly source their gold and diamonds.” (Alexander, 2019)

Organizations like The Responsible Jewelry Council provides the RJC ‘Code of Practices’ – which is ‘verified through a third party, independent, certification process’. By adopting these codes of practices jewelry firms and its supply-chain partners are able to address sustainability and ethics related to jewelry industry and to comply with ‘the 17 United Nations Sustainable Development Goals.’ (RJC, 2019).

As discussed earlier international standards ISO 14040 and 14044 are the basis for performing LCA evaluation for environmental matters while international standards based on qualitative measurement i.e., GDP, HDI and HFI are used to map the societal factors.

How can the case company's jewelry business become more sustainable?

5.1.7 Reusing & Upcycling and Alternative solutions

The research findings indicate that recycling in jewelry business is not black and white. When a jewelry is intended to be recycled, it goes through the same disassembling and re-melting process again. Only when it returns to its raw-form after refining process - which is raw gold or silver, it can be reused again to make a new piece of jewelry. Other materials e.g., precious stones can be reused only in their original shape due to stiffness. The best method to recycle old jewelries with details and stones is to re-purchase and re-sell the products in their original state with only minor changes and repair. Thus, new methods i.e., upcycling would be more effective than recycling to reuse the end-of-life (EoL) components in this context.

As the (Sverdrup, 2014) states that silver and gold occupied by society could take about 40-60 years to return to market for re-selling purpose, the issue could be solved by creating consumer awareness. Most of them also have been occupied as investment and "general dependency of recycling rates depends on metal prices" (Graedal et al., 2011) in (Sverdrup, 2014), and the prices depend on the metal market.

As per the case company's external designer, alternative materials for jewelries could be paper, wood and food items as they have been experimenting with those materials. CE or upcycling principles encourage designers to view every material on "Earth as having potential to be something else" (McDonough, 2002).

These materials are all 99% bio-degradable and are renewable natural resources. However, the drawback of these materials is that they lack possibility to be reused. Wood would be still ideal material to be combined with other metals e.g., silver to provide a better aesthetic to it. The supplier thinks that gold and silver plating is a cost-effective solution. According to (Sverdrup, 2014) efficiency can be achieved by limiting diffusive losses, and by better recycling of electronic waste.

Thus, the best way to support the circular economy is to buy-back products from customers, reuse the materials, upcycle them and resale. Upcycling in this case, is a process to recycle / reuse old jewelries to make them look better by adding extra value called 'additionality'. Upcycling is a gradual learning process and designers and people who follow this concept should be given time and freedom to experiment and innovate new product and service solutions. Besides already existing repair options at the case company's jewelry business; new services could be added to enhance circular economy e.g., leasing or renting jewelry to loyal customers or, members.

5.1.8 Eco-Design

Eco-designs are well-thought designs to have zero impact on the Earth as well as correct the past impairment by upcycling. As per case company's process observation, designs for products are based on customer demand. In terms of eco-design, thinking design is the first step in developing sustainable strategy and finding "innovative ways to approach consumption and generate "zero emission" design." (McDonough, 2002). Eco-design should be applied to the whole system including product, packaging and process to achieve total sustainability. Customers taste differ in terms of design however, the rise of minimalist and eco-design can be seen in the market. According to the study, eco-efficient and minimalist designs cut waste and they have flexibility to be reused / upcycled. On the other hand, process should be redesigned to use less energy providing firms eco-advantage in the long run (Daniel C. Etsy, 2009, pp. 13-18).

How can sustainability be integrated into case company's jewelry business?

6 RECOMMENDATION AND CONCLUSION

The discussion section mostly provides recommendations as where the case company needs to make improvements to lead their jewelry business in to the sustainable path. Here, summary of major points of the reaserch would be highlighted again.

6.1 Managerial Implications

Sustainable theory suggests that the firm should focus on all three dimensions of sustainability – environmental, social and economical while analysing the life cycle of products, process and service and their impact on all three dimensions. In the meanwhile, all three dimensions should be in complete harmony in order to achieve sustainability. One dimension cannot function without the other two.

The LCSA evaluation of this study indicates that currently the case company follows cradle-to-cradle or linear model, where the waste has not been fully reused or, upcycled. Thus, it is recommended to consider cradle-to-cradle model, where a product or process does not create waste at any stage of life-cycle by making the best use of waste products/materials. The model is also called circular economy, where material circulates, and waste is reused/upcycled to create new products of equal or greater value. As recycling degrades the value of jewelry instead, upcycling concept could be used to upgrade the value of EoL products/components. A figure has been drawn to suggest CE concept for the case company to re-think and remodel the traditional cradle-to-grave jewelry business system.

In order to integrate sustainability into the business and adapt the CE concept, the case company should start the business process by thinking efficient materials and eco-design by discussing the concept with the designers as which materials and designs create less / zero waste and are reusable multiple times without affecting the aesthetics. Add more minimalist designs to their collection – create more by using less materials and still add value in terms

of price and aesthetics - be innovative! Use of renewable, biodegradable and specially environmentally and ethically proven materials. For which, they can add certifications e.g., Fair Trade certified stamps on the final products. Suggest the suppliers to also comply with these regulations and verify second-hand materials acquired from other sources e.g., customers and local agents. As there would be raw-materials scarcity in the future, it is important to look for alternative sources of materials e.g., from the stock from society, electrical waste depots etc. This method of acquiring materials will eventually eliminate negative impacts of mining in the society and the environment and would be more cost-effective solution as well. Internal production process can be made more efficient by adding new technologies e.g., 3D-printers and laser cutter. It would be more eco-efficient as well as cost-efficient in the long-run to invest in solar-powered energy system for studios and stores. The author has created the following figure to visualize the new process suggested for the case-company to integrate sustainability.

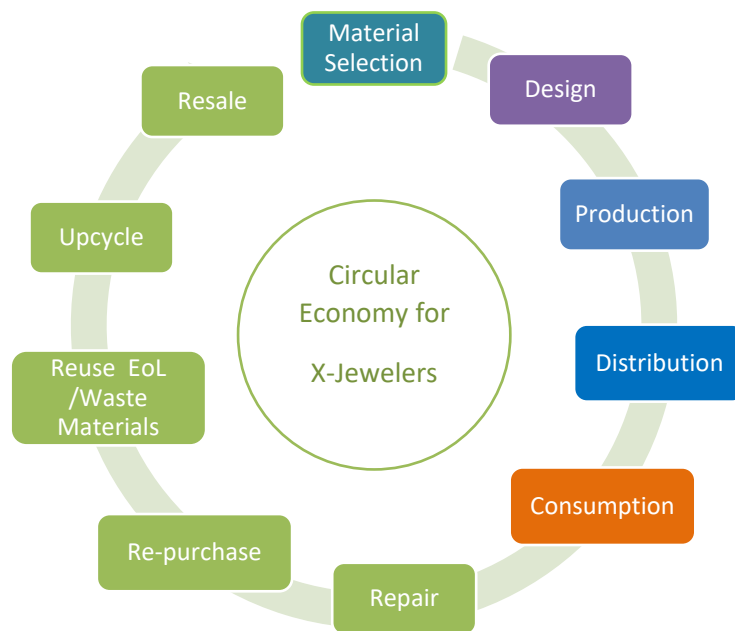


Figure 12. Adapted from Circular Economy concept for X-Jewelers ©

Currently, the distribution system does not need special focus. In the future, it would reduce cost as well as ‘ecological footprint’ created by long-haul transportation when the company starts acquiring most of its materials from local sources. As for the packaging material, current use of paper boxes and cloth bags are already ecological whereas, wooden boxes could be more added for durability. Additional service e.g., buying back packaging from customers to reuse would add value to both customer as well as business.

The consumers are currently benefitting from repair service and introducing re-making and upcycling options will enhance the circular economic model. For which, new innovative design options and various cost options would be valuable to provide ‘additionality’. Alongside, it is also important to inform customers regarding these new services and benefits by coordinating with sales personnel.

Above all, apply circular economic values to enhance the whole business process – reduce materials, recycle, repair, reuse and upcycle products, re-purchase and re-sell, re-think the process and above all communicate these sustainable values to all the value-chain members.

“To become a leader in sustainability, it is important to articulate what sustainability is, develop processes to promote sustainability throughout the corporation, measure performance on sustainability, and ultimately link this to corporate financial performance. “ (Buhovac, 2014, p. 21). In order to comply with sustainability trends, it is also essential to understand the changing societal values and be aware of media and other sustainability channels. Hiring a sustainability manager for analyzing potential issues in the business environment and find solutions to tackle them ahead of time would be ideal. These days businesses only seem to use the ‘greening’ strategy, which is temporary solution. By focusing more on creating a sustainable system in all the stages of life-cycle of a business would be beneficial in the long run; as it is difficult to change the whole system to fit-in later. It would be more effective if the sustainability strategy has been already thought and applied in the beginning of the process - in terms of fulfilling needs of all triple bottom line.

6.2 Conclusion and Further Research

The major idea of this study was to find solution for the case company's jewelry business to integrate sustainability. In other words, the study intended to guide the jewelry business towards the sustainable path by considering the current and future market changes in terms of sustainability. Sustainability is an evolving concept and businesses should be improved accordingly. The research analyzed the case company's products, process, packaging and activities by comparing the empirical part with the major sustainable models discovered during the study i.e., dimensions of sustainable business, triple bottom line – environment, society and economy, Life Cycle Sustainability Assessment and Circular Economic concepts.

The LCSA analysis of the case indicates that the case company should move from their current cradle-to-grave model towards more sustainable cradle-to-cradle system of the circular economy. The major impact of case company's jewelry business comes mostly from the external environment i.e., issues related to mining health hazards, livelihood, environmental pollution, soil degradation and toxicity. Alongside, jewelry business should be also aware of the resource exhaustion and scarcity due to over-mining of precious metals and stones. Businesses can thrive without adversely affecting the nature or, the society by exploring the alternative sources of raw-materials for jewelry production. And, for which the best solution is to reduce the material use by innovating minimalist designs, design products in a way that they could be easily reused and upcycled multiple times without losing their aesthetics. 'Upcycling' is the most current and trendy term based on the concept of circular economy and is opposite of recycling. Recycling jewelries multiple times loses its aesthetics or, beauty while upcycling adds value to the waste materials or, unused jewelries by giving them a new life. The idea of upcycling basically is to re-use the waste materials, by-products or unused items instead of completely crushing them as in disposing or recycling. Upcycling process includes creative designs by reusing the end-of-life (EoL) components and waste materials and converts them into a new product of equal or greater degree. By upcycling products life-cycle can be extended beyond the intended use. Consumer awareness to encourage them to reuse, upcycle and resale their long-accumulated materials for jewelry-making e.g., gold, silver and diamond etc. would bring about alternative / sustainable method to acquire resources. Moreover, with upcycling concept, new innovative and attractive

designs are created by making the best use of old and already existing materials, combining old materials with new and eventually creating additional value. The research indicates that the highest amount of precious metal stock remains with society in the form of jewelry, culinary, coins and investment bars. This alternative way of acquiring materials for jewelry business would eliminate mining and issues related to it and, businesses will resolve the resource scarcity situation arising in the future. The most efficient materials discovered by the study were gold and silver due to their flexibility to be reused, durability and they also have the best market value for reselling purpose. There are also other options mentioned in this study to explore bio-degradable and renewable materials to be used in the jewelry-making and the freelance designers are constantly improving designs by exploring with these alternative materials. It is up to the company to collaborate with them to create more innovative and ecological solutions for jewelry production while staying profitable.

The LCSA model suggest that a company should consider the whole life-cycle of their products and its impacts to be able to create sustainable products with zero waste fundamental. Furthermore, it is essential that the company equally involves all three dimensions of sustainability – environment, social and economy to form sustainable strategies. These days most of the businesses only think of ‘greening’ their products while the long-term solution would be to adapt the circular economy concept from the beginning and analyze the activities of the overall value-chain. This will provide a clear vision for the company to maintain sustainability of business and integrate improvement measurements. Thus, the best sustainable solution in this context, is to be constantly aware of the firm’s operating environment, make the best use of already existing materials and waste items, comply with regulations, get certifications and voluntarily imply sustainable changes and communicate sustainable values to all the channel members to avoid future consequences.

This study mostly applies sustainability theories related to business and explores models and impacts related only to the case company’s jewelry business. Since there is a lack of sufficient materials concentrating only on sustainable business, it was challenging to find information from limited sources. Thus, most of the important theoretical models have been gathered from various sustainable development and environmental science area as well. Besides, there has been very few prior researches conducted regarding sustainable business, sustainable

level of materials use for jewelry production and, the author did not discover any research on jewelry business during this study. Thus, this report would be applicable to most of the jewelry businesses looking to integrate sustainability into their business by finding suitable models mentioned here. The holistic approach of CE (Reduce/Reuse/Upcycling/Zero waste fundamental) is a new and arising concept in the business world, and the author found it challenging to convince the advisors that it is going to be an integral part of businesses in the future. The future consumers who believe in this concept are the 'generation z' e.g., Greta Thunberg.

As this research mostly focuses on the company's point of view to integrate sustainably hence, the further research could be done from the customer's point of view – as how much jewelry or precious materials they accumulate and what are the reasons for not reusing or, reselling them etc. The other field could be to apply the same sustainable business perspective of this research to study other sectors than jewelry business. This research only applies qualitative methods of analysis i.e., CE, LCSA etc., the further research could also be based on quantitative methods e.g., Lifestyle Material Footprint (LMF) & Material Input per unit of Service (MIPS) even though these methods need expertise from the environmental science field to analyze individual product's sustainability/ecological footprints. Furthermore, Sustainability Reporting could be another arising topic to be used in this field.

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8.2 Interview Guide

A. Resource Acquiring

- How long are you in this business (jewelry production, supplying, designing, selling)?
- Where do you mostly get your raw-materials from? Local, International sources in %? Which one is cheaper or, of better quality?
- What form of material do you mostly use for production – raw in block, coins? Old jewelries and what else?

- What do you mostly do with the old jewelry if you re-purchase from your customers? Do you also get them from other sources? Which?
- Which materials have you used so far for producing jewelry? e.g., Gold, Silver, Precious stones, artificial stones and what else?

B. Material Efficiency

- Which material has been your favorite so far? And, why? Advantages and Disadvantages
- Which materials are the most/least durable?
- Which one creates more material waste? (Amount of material lost while molding a new piece of jewelry in percentage for both)
- Which other materials are popular these days, which other new materials would you use and why?
- How important is quality of raw-materials? Where does it show its effect the most?
- Do you use quality certifications for your products? Local, International? What are the benefits of using them?

C. Cost effectiveness

- Which ones do you prefer and why? e.g., price, time, ease of use etc. Using new block of material (materials in brand-new state) or used jewelry?
- What is the best way of production to reduce material/energy waste e.g., hand-made vs. machine, what else?
- What is the re-sale value of various jewelry (for customers) – gold, silver, diamond in %. Other precious materials and how is it determined?
- What about market value of them while re-purchasing (for the business)?
- What are the possible benefits of re-purchasing jewelry – for buyers/producers, for customers, and for the environment and who else?

D. Ease of Reusing/Recycling/Upcycling

- How does your jewelry business process/cycle work in steps? (e.g., 1. Material selection, 2. design, 3. production, 4. package, 5. sell, 6. re-purchase. 7. Re-make etc.)
- How often customers come to repair or remold their old jewelry? In a month? % How much do you charge for it?
- What is the depreciation % of old jewelry? How do you measure it for various materials (e.g., time of use? Market price?)
- What does 'recycling' mean in jewelry business? Do you completely melt old jewelry first before you re-make a new one or, slightly modify it? What is the process often used and why?
- How easy/difficult is it to reuse old jewelry? Pros n cons?
- Have you heard of the term 'Upcycling'? Is it possible to create a better piece of jewelry out of old one? How easy is it to do so?

- Have you heard of using gold from old computers/electronics to make jewelry? (e.g., recycled gold from the motherboards of end-of-life Dell computers) What is your opinion on it?

E. Packaging (Boxes/Bags):

- What kind of packages do you use for your jewelry? Materials/Type? Why do you prefer it?
- You have recently changed (transformed) your packaging materials (from which to which) and why?

F. Design & Technology

- How does design play a role for amount material use or, ease of making etc.? (e.g., classic, modern etc.)
- Has there been a new, more effective method/technology of producing jewelry? Have you heard of 3D printing? How effective would it be for jewelry production? In terms of design, material waste etc.)

G. Corporate Social Responsibility

- What are your efforts to improve social conditions of employees and your external environment?
- How do you manage IPR issues to secure work of designers i.e., patent, registration, licensing etc.?
- Are you aware of impacts of precious metal and stones mining? How does it affect your business?
- Do you certify your jewelries' ethics by using Fairtrade, Eco-label etc.?