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Circular Economy, Transition to a Circular Economy for Business Development

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Abstract

The circular economy stands as a promising solution to urgent environmental crises, including climate change, biodiversity loss, and resource depletion. Assessing its economic implications is pivotal for transitioning from linear to resource-efficient production chains. The circular economy, driven by principles such as "reduce, reuse, recycle", aims to reduce production and consumption costs while delivering significant environmental benefits. Efforts to achieve sustainability goals revolve around three broad categories: green resource procurement, operational efficiency, and end-of-lifecycle considerations. Many companies, including Cisco, express optimism about achieving net-zero commitments by 2050, yet a significant proportion faces challenges, stemming from organizational misalignment and skill deficits. This research focuses on Cisco as a case study to examine its adoption of circular economy principles, the transition of its business practices, and the resulting impact on business development strategies. Utilizing a case study methodology, this research reviews theories, reports, and statistics to identify key features, characteristics, and results of best practices. The paper comprises four chapters, addressing circular economy concepts, methodology, the case study, and implications of findings. Three hypotheses guide this study and six research questions. The research methodology is the case study to explore the transformative potential of the circular economy, focusing on Cisco's case. It uncovers the economic dimensions of circular economy adoption, emphasizing its benefits, challenges, and critical lessons for other companies embarking on similar sustainability journeys. Cisco's multi-faceted strategies, spanning economic development, education, employment policies, energy, land development, sustainable development, training, and transport, exemplify how circular economy principles can be embedded into various facets of an organization.

Key words: circular economy, Cisco, business development, sustainability, integration

Extended summary

Le crisi finanziarie, energetiche e ambientali a livello globale hanno le loro radici nella non sostenibilità di modelli di produzione e consumo poco ecologici, basati per secoli su un'intensa estrazione di risorse naturali. Nell'epoca attuale non possiamo più ignorare la necessità di comprendere gli impatti catastrofici dello sviluppo attuale delle imprese sull'ambiente e sulla società. L'economia circolare si presenta come una soluzione promettente per affrontare crisi ambientali urgenti, tra cui i cambiamenti climatici, la perdita di biodiversità e l'esaurimento delle risorse. Attraverso la valutazione delle implicazioni economiche, è possibile sviluppare catene di produzioni efficienti, dal punto di vista delle risorse, a partire dai pre-esistenti modelli linear. L'economia circolare, basata su principi come "riduci, riutilizza, ricicla", mira a ridurre i costi di produzione e consumo, fornendo al contempo significativi vantaggi ambientali. Gli sforzi per raggiungere gli obiettivi di sostenibilità ruotano attorno a tre categorie fondamentali: approvvigionamento di risorse verdi, efficienza operativa e considerazioni sulla fine del ciclo di vita. Molte aziende, tra cui Cisco, esprimono ottimismo riguardo al raggiungimento degli impegni di zero netto entro il 2050, ma una significativa proporzione si trova di fronte a sfide derivanti da disallineamenti organizzativi e carenze di competenze.

La metodologia di ricerca è lo studio di caso per esplorare il potenziale trasformativo dell'economia circolare, concentrandosi sul caso di Cisco.Questa ricerca si concentra su Cisco come studio di caso per esaminare l'adozione dei principi dell'economia circolare, la transizione delle sue pratiche commerciali e l'impatto risultante sulle strategie di sviluppo aziendale. Utilizzando una metodologia di studio di caso, questa ricerca esamina teorie, rapporti e statistiche per identificare le caratteristiche chiave, le peculiaritàe i risultati delle migliori pratiche. Il documento è composto da quattro capitoli che trattano concetti di economia circolare, metodologia, studio di caso e implicazioni dei risultati. Tre ipotesi guidano questo studio e sei domande di ricerca. La parte più importante di questi studi di caso sono le lezioni che possono essere tratte dall'esperienza di Cisco nel passare alle pratiche dell'economia circolare. Si può sicuramente vedere che l'implementazione di strategie e innovazioni circolari richiede un certo ammontare di investimenti di capitale, tuttavia le imprese circolari traggono profitto da questi investimenti nel medio e lungo periodo, come nel

caso di Cisco nella gestione ambientale. Pertanto, la pianificazione strategica a lungo termine è essenziale per un'azienda, poiché le consente di essere proattiva nella sua crescita. Le prove dimostrano che la transizione verso un'Economia Circolare può portare benefici a persone e pianeta, oltre a offrire alle imprese nuovo valore e un percorso a lungo termine.

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Introduction

The circular economy is often considered a promising solution to urgent environmental issues such as climate change, biodiversity loss, and resource depletion. However, assessing the economic implications of implementing a circular economy is crucial for transitioning from linear to cyclical resource-efficient production chains. As an alternative to the existing consumption model, the circular economy has emerged as a means to reduce production and consumption costs. Alongside significant environmental benefits, the global shift towards a circular economy creates business opportunities that benefit the economy and increase profits. The economic dimension of the circular economy has recently garnered significant interest from scholars and practitioners. It represents a departure from an economy characterized by unsustainable production and excessive resource consumption. The growing number of publications and studies requires a comprehensive analysis of this field. This entails a rethinking of production and consumption models to drastically reduce non-recyclable waste. The process of transitioning to a circular economy itself requires significant measures and government-level support.

This research centers on Cisco as its primary object of study. The investigation delves into how Cisco has embraced the principles of a circular economy, navigated the transition of its business practices to align with these circular economy principles, and the consequential impact this transition has had on its business development strategies and outcomes.

The goal of this study is to analyze and assess the transition to a circular economy as a strategy for business development, focusing on the case study of Cisco.

The primary method employed in writing this paper was the case study to analyze and review the relevant theory, reports, and statistics to identify and underline the key features, characteristics and results of best practice.

This paper consists of introduction, conclusion, and four chapters. Chapter one delves into the fundamental concepts of a circular economy, shedding light on its principles, essence, and the motivations that drive sustainable practices. It explores how the circular economy model can be leveraged to foster business growth, as well as the critiques and limitations associated with its implementation. Chapter two 2 explains the chosen methodology, detailing the strategies employed for collecting, analyzing, and interpreting data. It provides insight into

the thought process behind selecting the methodology that aligns best with the research objectives. The third chapter contains of the case study, analyzing company's circular economy principles and strategies. It offers a comprehensive overview of Cisco, including its various initiatives, programs, and a dedicated commitment to sustainable development. This chapter scrutinizes how circular economy principles have been seamlessly integrated into Cisco's operational practices. The fourth chapter delves into the implications of these findings, considering how they resonate within the context of circular economy adoption for driving business development and provides the answers to the research questions.

Chapter 1. Literature review

1.1 The concept of circular economy

The goal to achieve sustainable economic growth is one of the key issues for the economy of any country. In modern understanding, the concept of sustainable growth encompasses not only positive dynamics of economic indicators, but also social stability and ecological balance, which in recent years have been receiving increasing attention. The transformation of the traditional economic model with consideration of environmental challenges has become a global trend. Within this trend, one of the models for achieving sustainable development is the circular economy (Stromstad, 2019). This concept is characterized by an economy that is regenerative and aims to ensure that products, components, and materials are always highly usable, reusable and therefore of higher value.

A regenerative economy involves shifting away from business models that deplete resources to reach approaches capable to create positive impacts for both the environment and society. Within context businesses can at least theoretically achieve a state where they have a positive influence on climate, nature, society, and the economy. This shift goes beyond merely reducing emissions and involves actions that actively improve the conditions of the environment (Yashi, 2021). In a regenerative economy, businesses contribute to the removal of carbon dioxide from the atmosphere, aiding in the overall reduction of its levels. They also work towards fostering greater biodiversity for the future, which means supporting a wider variety of species and ecosystems. Additionally, this approach seeks to ensure fairness, justice, equality, and inclusivity within and among local stakeholders, as well as within the wider social and economic systems. In essence, a regenerative economy emphasizes positive actions and contributions that help restore and enhance the environment, society, and the economy, rather than just focusing on reducing harm or negative impacts (Stokel-Walker, 2022).

The circular economy is envisioned as a continuous positive cycle of development that protects and increases natural capital, optimizes resource profitability, and minimizes systemic risk through the management of finite stocks and renewable flows. This model effectively operates at any scale and ultimately aims to separate the consequences of global economic development from the consumption of finite resources (Velenturf & Purnell, 2021).

The concept of the circular economy has a rich historical background, emerging from a blend of various intellectual influences. Its origins cannot be attributed to a single author or linked to a precise date. Instead, it draws inspiration from multiple schools of thought. One significant precursor to the circular economy concept dates back to the 1960s when Kenneth Boulding (1966), a British economist, depicted Earth as a self-contained "closed spaceship" in his work *The Economics of the Coming Spaceship Earth*. Boulding's (1966) perspective emphasized the finite nature of Earth's resources and the need to adapt to its ecological cycles, prompting resource recycling as a necessity. Subsequently, in the 1970s, the Club of Rome[1] (1972) introduced the notion of *The Limits to Growth*. This concept underscored the idea that sustainable survival hinges on curbing production and consumption, suggesting a constrained approach to human activities.

In 1970 Swiss industrial analyst W. Stahl introduced the term "cradle-to-cradle", which was popularized by W. McDonough and M. Braungart in 2002. In this approach the traditional concepts of production and sale were replaced by a focus on delivering services through leasing arrangements. Its fundamental objective was to shift the emphasis from selling products to providing efficient and satisfying outcomes. Rather than dealing in physical goods, the service economy aimed to sell results. In accordance with this model, products were designed to be returned to manufacturers for repair, multiple reuses, and enhancement. The term "cradle-to-cradle" reflects this process, highlighting the journey of goods from their inception to their rejuvenation.

Braungart (2002) acknowledged the potential of eco-efficient strategies in the short term, as they could reduce the ecological impact of business activities while simultaneously generating cost savings. However, he asserted that these strategies were insufficient for achieving long-term goals. The secondary recycling process represents a "downcycling" cycle, as products are not originally designed for reuse, and the recycling process diminishes the quality of materials, rendering them suitable for less valuable applications. According to Braungart and McDonough (2002, p. 51) "eco-efficiency is about getting more from less".

An important milestone in the development of the circular economy concept was the evolution of the concept of industrial ecology. Industrial ecology explores the interrelation

[1] The Club of Rome is an unaffiliated non-profit group composed of intellectuals and business executives. Its objective is to engage in thoughtful dialogues about urgent worldwide matters.

between the industrial sphere and the surrounding environment, where both humans and living organisms exist. Its primary objective is to reduce pollution through the modernization of production processes. Within the realm of industrial ecology, is introduced the notion of an "industrial ecosystem", functioning as an analogy to biological ecosystems. This approach optimizes the consumption of energy and materials while minimizing waste production (Frosch & Gallopoulos, 1989).

In 1994, J. Lyle introduced the concept of regenerative design emphasized moving beyond sole focus on energy efficiency. Instead, it urged the consideration of emerging buildings within the context of surrounding ecosystems, actively participating in their restoration. The principles underlying regenerative design encompass the following:

1. Nature as a model. This principle involves studying natural processes and applying these patterns to model human processes, systems, and strategies, addressing societal challenges.
2. Nature as a measure. Regenerative design employs ecological standards to assess the sustainability of innovations, using nature as a benchmark for evaluation.
3. Nature as a mentor. This approach involves observing and evaluating nature to derive guidance and insights for design and decision-making processes (Lyle, 1994).

The next pivotal step in the evolution of the circular economy concept came with the publication of J. Benyus's (1997) book titled *Biomimicry: Innovation Inspired by Nature*. The idea of biomimicry (also known as biomimetics) was conceived by Otto Schmidt in the 1950s and further developed and shaped by Benyus. Biomimicry involves the emulation of models, systems, and elements found in nature to solve complex human challenges. The circular economy concept encompasses the most widely sought-after practical approaches from various scientific disciplines. To a certain extent, each of the aforementioned concepts contributes to the circular economy, continuing to evolve within this framework as a distinct direction (Kekic, Stojanovic, & Markic, 2020).

Some authors mistakenly equate the circular economy solely with the process of recycling. However, this is a rather inaccurate conclusion. The circular economy goes beyond merely addressing waste recycling at the end of a product's lifecycle, it involves the

integration of technological, organizational, and social innovations throughout the value creation chain, starting with eco-friendly product design and ensuring waste prevention.

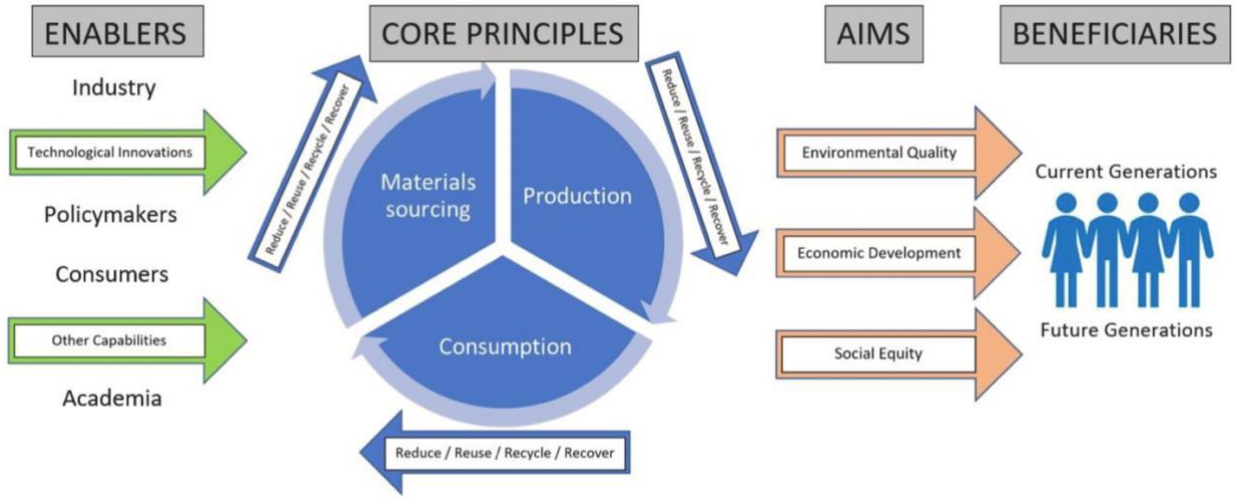

Figure 1. Structure of circular economy (Source: Kirchherr, et al. 2023)

Quoting the Ellen MacArthur Foundation (2023), whose mission is to accelerate the world's transition to a circular economy, the circular economy is characterized by transitioning to renewable energy sources and creating economic, natural, and social capital. The closed-loop economy constructs and restores the overall state of the system. The concept recognizes the importance of economy-wide efficiency. The shift to a circular economy is not merely a correction aimed at reducing the negative impact of a linear economy. Instead, it represents a systemic shift that ensures long-term sustainability, generates business and economic opportunities, and delivers environmental and social benefits.

Therefore, the circular economy represents a novel approach to value creation, founded on extending the product lifespan through enhanced design, maintenance, and the efficient return of waste from the end of the supply chain to the beginning for more effective utilization. The primary objective of the circular economy is to replace the current inefficient linear economic model (Kirchherr, et al. 2023). Research indicates that the widespread adoption of the linear economy and inefficient resource management are the root causes of global environmental issues, contributing to significant emissions of pollutants, depletion of natural resources, and the generation of substantial waste volumes.

1.2 Principles and essence of circular economy and sustainability

The traditional linear economic model, based on the "production, consumption, disposal" principle, will not contribute to achieving sustainable development due to wasteful use of natural resources, inefficient consumption, large volumes of waste, and adverse environmental impacts (Savini, 2023). The traditional linear economy aims to use resources for as long as possible, extracting maximum value from them during use, and eventually recovering and reusing products and materials. The circular economy is based on business models that replace the "end of life" concept with reduction, reuse, recycling, and material recovery in the processes of production, distribution, and consumption at the micro level (products, companies, consumers), meso level (eco-industrial parks), and macro level (city, region, country), with the goal of achieving sustainable development. This entails creating environmental quality, economic prosperity, and social equity for both the present and future generations. Therefore, in recent times, increasing attention is being directed towards an alternative model known as the circular economy (closed-loop economy), which aims to maximize the long-term preservation of product and resource value through the "production, consumption, reuse" principle (World Economic Forum, Future of Reusable Consumption Models, 2021). Three key features inherent to the circular economy are distinguished:

- firstly, enhanced control over natural resource stocks and the maintenance of a sustainable balance of renewable resources to preserve and sustain the natural capital at an inexhaustible level;
- secondly, the optimization of consumption processes through the development and dissemination of products, components, and materials that meet the highest level of their reusability;
- thirdly, the identification and prevention of negative external effects of current production activities with the aim of increasing the efficiency of the economic and ecological systems (Vasko et al., 2016).

In the modern stage of development, society is facing new requirements, conditions, and mechanisms of economic activities. On one hand, breakthrough digital technologies are undeniable drivers of economic, technological, and social progress, offering various opportunities for improving the quality of life. On the other hand, within the context of limited

natural resources and persistent environmental pollution (resulting from economic growth and the process of globalization), maintaining the traditional economy could inevitably lead to an ecological crisis. In light of this, in 1992, the United Nations adopted a new strategy for human activity - the strategy of sustainable development. This strategy can be defined as a model of civilization development that satisfies the current needs of society without compromising the ability of future generations to meet their own needs. In 2015, as part of the Sustainable Development Agenda for 2030, the United Nations established 17 Sustainable Development Goals (SDGs) (European Commission, 2015). These goals serve as a compelling call to action for all countries (both developed and developing) within the framework of a global partnership. They are aimed at addressing global issues such as climate change, environmental pollution, inequality, poverty, hunger, conflicts, and more (Figure 2).

Figure 2. Sustainable Development Goals (Source: Gov.pl, 2023)

Achieving these goals requires comprehensive actions to address social, environmental, and economic problems, with special emphasis on holistic and inclusive development. Thus, the following key characteristics of the circular economy can be deduced:

- A closed-loop supply chain is a fundamental aspect of the circular economy, involving reverse logistics. This means that products are returned for secondary production after consumption.
- Instead of relying heavily on primary resources, the circular economy emphasizes the use of renewable energy sources and secondary resources.

- Maximization of process efficiency in product lifecycle. This involves extracting the maximum value from product usage and extending its lifespan through repair and refurbishment.
- Circular economy principles are meant to be applied at all economic levels, from individual firms to governments.
- The circular economy is built upon the principles of reducing waste, reusing materials, recycling, and recovering resources.
- The goals of implementing the circular economy concept include ensuring long-term sustainability, conserving natural resources, reducing waste and negative environmental impacts, achieving economic prosperity, and obtaining social benefits. In other words, transitioning to a circular economy contributes to achieving sustainable development goals.
- The concept of sustainable development is a theoretical model of humanity's desired future (harmonious, balanced socio-ecological-economic development), while green and circular economies entail specific projects for the practical implementation of the sustainable development paradigm (Meseguer-Sánchez et al., 2021).

Based on the theory, a circular economy is characterized by minimizing the consumption of primary raw materials and processed resources, accompanied by a reduction in waste sent for disposal, while simultaneously decreasing the areas occupied by corresponding landfills and unmanaged dumpsites. The fundamental principle underlying the circular economy is to preserve as much value as possible from products and components when their lifecycle comes to an end (Savini, 2023).

1.3 Motivations for circular economy sustainable practices

The foundation of the transition to a circular economy is often referred to as the Fourth Industrial Revolution. With the global proliferation of robotics, the internet, digital data, and artificial intelligence, all aspects of human life are undergoing change. The rapid pace of innovative technological advancement is pressuring companies to alter existing business models and develop new approaches to products, services, and processes. Conversely, the swift evolution of technology is a key driver shaping modern consumer behavior: these

technologies expand consumption possibilities, granting access to a wide array of goods and services.

Turning to the motivations for transitioning to a circular economy, it is important to highlight the positive outcomes associated with such a shift, as these very outcomes serve as catalysts for such changes. For instance, the opportunity to create more new jobs. In 2015 WRAP (Waste and Resources Action Programme) published the report which showed that the adoption of a circular economy could generate 3 million new jobs and reduce unemployment by 520 000 individuals within EU member countries by 2030. According to WRAP estimations in 2015 3,4 million people were employed in circular economy sectors, such as repair, recycling, rental, and leasing across the European Union (Recycling Today, 2015). In 2018 this figure has reached 3,9 million people in EU (IISD, 2018). According to International Labour Organization (2023) there is a potential to generate around seven to eight million new jobs. The expansion of the circular economy opens up employment possibilities across all member states. The restoration and repair of old goods, buildings, and infrastructure lead to the creation of skilled jobs within local workshops.

A study of seven European countries revealed that transitioning to a circular economy will reduce greenhouse gas emissions by up to 70% in each country (Stahel, 2016). Other data suggests that circular economy methods could cut greenhouse gas emissions by 60% by 2050 (UN, 2023). There is also an indirect way to reduce those emissions, by eliminations waste and reducing of landfills and waste disposal sites (Hailemariam & Erdiaw-Kwasie, Towards a circular economy: Implications for emission reduction and environmental sustainability, 2023).

Companies benefit from adopting circular business models through increased innovation and additional competitive advantages, the emergence of new revenue streams, heightened customer loyalty, and strengthened relationships with partners throughout the value chain. For consumers, the development of a circular economy signifies the consumption of environmentally friendly products and, in some cases, a reduction in their costs (Kadio, 2023).

Reducing the use of natural resources will lead to a decrease in their extraction, imports, and a decline in prices. To make it possible, policymakers should encourage businesses to adopt strategies that facilitate a successful shift to a circular economy. This involves promoting business models that prioritize municipal waste recycling, design products for

durability and recyclability, and encourage material reuse (Hailemariam & Erdiaw-Kwasie, Towards a circular economy: Implications for emission reduction and environmental sustainability, 2023). Transitioning to circular practices requires supportive institutions and infrastructure at the firm level. Governments should set an example by demonstrating the feasibility of circular practices and encouraging private companies to follow suit. Government incentives, such as grants, subsidies, or tax credits, can be offered to firms that prioritize environmental protection. Subsidies can also be used to motivate firms to adopt circular practices and reduce emissions. Circular economy knowledge should be communicated in a way that aligns with businesses' interests. Linking carbon emission reduction to business objectives can be effective, highlighting how it leads to cost savings and increased productivity. Integrating circular economy knowledge into business strategies over time can facilitate understanding of emission reduction interventions. Effective communication within companies can also spread circular knowledge among employees, positively impacting the company's environmental footprint. Stronger regulations may be necessary. Some businesses may voluntarily reduce emissions and apply circular strategies, but others may need external pressure (Hailemariam & Erdiaw-Kwasie, Towards a circular economy: Implications for emission reduction and environmental sustainability, 2023). For example, regulations can address carbon emissions fairly and cooperatively, indicating the urgency of the issue. Combining an educational program that instills environmental values and citizenship with incentive frameworks can gradually drive long-lasting strategic shifts toward a circular economy.

1.4 The role of circular economy for business development

In the context of circular economy, new business models and consumption patterns are emerging. A business model is the approach a company employs to create value and generate profit. Globalization and heightened competition drive companies to establish sustainable business models that are less susceptible to negative globalization effects. The sustainability of these business models hinges on the efficient utilization of natural, material, financial, and intellectual resources. The transformation results in a shift toward networked interactions and the formation of ecosystems comprising suppliers, partners, consumers, and competitors

around companies. Within the framework of a circular economy, five distinct business models are identified, which can be used individually or in combination (Geissdoerfer et al., 2018).

The supply chain in a circular business model. Circular supply chains involve a model where finite resources are substituted with biodegradable, recyclable, or entirely renewable alternatives. Circular supply chains also encompass the return of products to the manufacturer (supplier) for processing when they have reached the end of their lifecycle or become obsolete. They are applied in sectors such as energy and automotive manufacturing. The categorization of supply chains within a circular economy, includes open-loop supply chains, closed-loop supply chains, and circular supply chains (figure 3) (Vegter, Hillegersberg, & Olthaar, 2020).

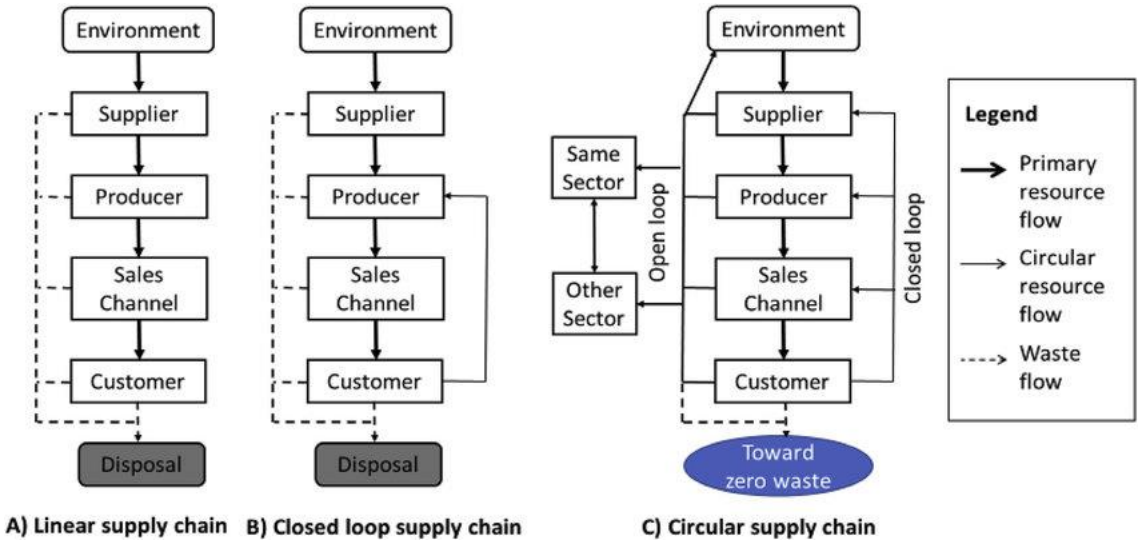

Figure 3. Supply chains (Source: Farooque et al., 2019)

In a linear supply chain, resources are taken from the Earth and waste is discarded at various stages of the supply chain, often ending up in landfills. This results in resource depletion and waste accumulation. A closed loop supply chain aims to improve environmental performance by returning products and packaging materials to the producer for value recovery. However, the recovery is limited within the original supply chain, and waste reduction is not comprehensive. A circular supply chain goes beyond closed loop concepts. It collaborates with other organizations within the same or different sectors to recover value

from waste. The goal is to generate minimal to zero waste by systematically restoring and regenerating resources within the industrial and natural ecosystem (Farooque et al., 2019).

Product as a service. This business model refers to the provision of a product for temporary use through methods such as renting or leasing, instead of outright purchasing. Additionally, the provider offers service and maintenance during the period of product usage. Since ownership rights remain with the manufacturer, there is an incentive to create durable and high-quality products. This business model is well-suited for high-cost items. For the manufacturer, this approach allows them to both saturate the market with their products and generate profits through post-sale services and support during product usage. Ultimately, the manufacturer takes responsibility for product disposal at the end of its lifecycle, leading to the formation of a closed-loop supply chain (Wijkman, 2022).

Recovery and recycling. This model is based on the use of technological innovations for resource recovery and reuse, aimed at eliminating losses through waste reduction and enhancing production profitability through the utilization of return flows. Waste reduction, in turn, enables the reduction of landfill sites and waste disposal areas (OECD, 2018).

Product life extension. This model preserves the value of a used product through reconstruction, repair, upgrading, or remarketing. It works well in areas where newer product models compared to earlier ones offer only slight increases in productivity (Bakker et al., 2019). For instance, the significant waste (26 million pounds) is generated by discarding clothing and consumer products, a large portion of which could be reused or recycled. To produce enough cotton to make one shirt is needed 2,700 liters of water. It means that when throwing away products, all the energy and resources used in its production are lost. While recycling is beneficial, reusing and repairing products are more impactful in terms of reducing environmental harm. However, many products are not designed for easy recycling, which can lead to high energy consumption in recycling processes too (Lee G. , 2019).

Sharing platforms. The sharing platform model is an economic model based on the joint utilization of underutilized assets – from space to skills, with or without payment. Through sharing economy online platforms (often in the form of mobile applications), participants can exchange their products without the need for purchasing. During the investigation into the nature of the sharing economy, differences in opinions among various experts were identified. Some believe that only individuals act as suppliers of goods or services. They consider online

platforms of the consumer-to-consumer type as part of the sharing economy, rather than business-to-consumer. Others also include legal entities (companies) as participants in the sharing economy (Schwanholz & Leipold, 2020). Unlike leasing and renting, the period of product usage in sharing is much shorter, and furthermore, the number of users on the sharing platform is much larger. In the sharing economy model, traditional institutions are replaced by a trust-based institution that forms through sustainable network interactions within the community. It is necessary to highlight the characteristics of the sharing economy within the framework of the sustainable development concept:

- this model enhances the level and efficiency of product usage through redistribution and a larger user base;
- it shifts the mindset towards collective consumption and renting instead of purchasing. Sharing allows using a product only when needed and then sharing it with others. This type of consumption implies that ownership is less important, and there is no need to own a product to consume it. Therefore, production under a sharing economy can be reduced;
- it is helpful to the citizens with low-income (free food sharing actions, etc.);
- in the transportation sector, sharing can have a positive impact on the environment by reducing the number of private vehicles (and thus the distance traveled), leading to decreased emissions. For example, in Shanghai, shared motorcycle usage reduced carbon dioxide and nitrogen oxide emissions by 25,000 tons and 64 tons, respectively, in 2016 (Li et al., 2020). Estimates suggest that each car-sharing vehicle replaces 9-13 private cars in the US, 7-10 in Germany, 4-6 in Belgium, and 5-7 in Sweden (Harris et al., 2021). Carbon emissions in Europe have decreased by 15-20% due to car sharing, which utilizes low-emission new cars (Velez & Plepys, 2021). However, car-sharing can also have negative impacts: rented cars are used more intensively, leading to a shorter lifecycle compared to private vehicles. This could lead to increased car production and waste generation, potentially negating the positive effects of car-sharing.
- sharing platforms allow for reusing products, which in the long run could lead to reduced resource requirements, production volume, and waste.

Summing up, each circular model contributes to sustainable development in its own way and impacts business evolution. For instance, circular suppliers are essential for the development, production, and distribution of recyclable materials that prevent waste and used products from being buried or incinerated. Resource recovery technologies help transform products and waste into new raw materials for application in new production cycles. The advancement of exchange platforms enables product reuse, and business models associated with extending the product lifecycle encompass industrial refurbishment, remanufacturing, and repairing of used products, their components, and parts. The implementation of the "product as a service" business model allows companies to provide products to customers for temporary use along with a package of services, including technical maintenance.

1.5 Limits and questions of circular economy

In the context of literature review and analysis, both the drawbacks of the circular economy model and criticisms were identified. One primary concern is the lack of a specific definition characterizing the concept:

> there is no single commonly accepted definition of the term “circular economy”, but different definitions share the basic concept of decoupling of natural resource extraction and use from economic output, having increased resource efficiency as a major outcome.
>
> (Mavropoulos & Nilsen, 2020, p. 33)

As a result, every business, individual, and organization can interpret the circular economy differently (Kirchherr et al., 2017). Some authors highlight that the circular economy raises questions about its ontological and epistemological foundations, including ethical considerations, in relation to the complex environmental, social, and economic challenges of today (Temesgen et al., 2021). Defining the circular economy appears more challenging than pointing out what it is not (Kovacic et al., 2020). As stated, it is “not a theory but an emerging approach to industrial production and consumption” (Korhonen et al., 2018b, p. 551). Rather, it's a multiplicity (Corvellec et al., 2020), serving as an umbrella concept that generates enthusiasm by seemingly addressing various issues. However, scrutiny increases when

operationalization attempts reveal unresolved definitional concerns (Blomsma & Brennan, 2017). While the circular economy's diverse interpretations contribute to its appeal (Velis, 2018), it also makes it challenging to grasp its true essence. Hence, the circular economy has been likened to various concepts, such as a patch adaptable to changing conditions (Fitch-Roy et al., 2019), a vague narrative (Niskanen et al., 2020), a horizon (Lazarevic & Valve, 2017), and a floating (Niskanen et al., 2020) or empty signifier (Valenzuela & Böhm, 2017) lacking inherent substance.

Another point is, that challenges and complexities involved in completely eliminating waste and achieving perfectly closed material loops make such a scenario with "no waste" unrealistic or impossible to achieve in practical terms:

> Every loop around the circle creates dissipation and entropy, attributed to losses in quantity (physical material losses, by-products) and quality (mixing, downgrading). New materials and energy must be injected into any circular material loop, to overcome these dissipative losses.
>
> (Cullen, 2017, p. 483)

Advocates of the circular economy tend to oversimplify consumption by focusing on purchasing and recycling, while citizens are often perceived as consumers and users rather than active participants. This perspective assigns citizens the role of accepting practices designed by experts. Circular strategies also fail to consider the significant amount of materials and items already in circulation within homes, businesses, and infrastructure. The circular economy mainly concentrates on the flow of newly manufactured goods, neglecting existing stocks. However, this approach may lead to rebound effects, where efficiency gains in individual products lead to increased consumption and material usage, counteracting the intended benefits. Developing economies might experience more pronounced substitution effects due to circular practices. Moreover, the circular economy's focus on cycling materials could result in retaining hazardous substances within the economy, instead of phasing them out, potentially increasing the spread of dangerous elements (Corvellec et al., 2021).

There are also other sustainability movements which have some similarities with circular economy such as:

- Recycling. It is a process of converting waste materials into useful items, creating new products from old materials. It is commonly practiced with materials like paper, glass,

and metal. Complex products, such as electronics or cars, are harder to recycle due to their diverse materials. Recycling is environmentally preferable to waste disposal and incineration. The waste hierarchy prioritizes Reduce-Reuse-Recycle, suggesting its best to minimize consumption, reuse items, and then recycle materials. Recycling is the foundational step in this hierarchy (Lienig & Bruemmer, 2017).

- Waste minimization. The focus is on decreasing hazardous waste for disposal or energy recovery, emphasizing reuse, remanufacturing, and recycling. This approach gained prominence in the 1990s (Ojovan & Lee, 2014).
- Cleaner production (CP). The methodology focuses on preventive solutions rather than end-of-pipe technologies. Studies show that processes designed to avoid creating pollution or waste are environmentally and financially beneficial. This approach conserves materials and energy and avoids low-efficiency waste. In contrast, end-of-pipe solutions add supplementary devices to existing processes, which can have extra costs and sometimes shift pollution forms. Responsible behavior can prevent at least half of environmental issues, and the development of technologies alone cannot solve environmental problems – behavioral changes are necessary (Tóth, The Truly Responsible Enterprise—About Unsustainable Development, the Tools of CORP-ORATE Social Responsibility (CSR) and the Deeper, Strategic Approach, 2007).
- Zero emission. It is often associated with the automotive industry, indicating an industrial or mechanical process, motor, or engine that does not emit any waste products harming the environment or contributing to climate change. The term is closely linked to best available technologies, eco-efficiency, and LCA. The origin of the concept, with the Zero Emissions Research and Initiatives (ZERI) movement established in 1994 and later integrated into the Blue Economy movement (Tóth, 2019).
- Green economy can be defined as an economic system that focuses on mitigating environmental risks and ecological scarcities while promoting sustainable development without compromising the environment (Kahle & Gurel-Atay, 2014). This concept shares a strong connection with the fields of environmental and ecological economics, although it places a more pragmatic emphasis on its application in politics. In 1989 D. Pearce published a report titled *Blueprint for a Green Economy*. This report showcased

models that assigned value to environmental elements at risk of pollution. The underlying principle of the green economy concept promotes the establishment of taxation systems that discourage pollution due to increased costs while simultaneously generating funds for environmental cleanup. A central tenet of the green economy philosophy is encapsulated in the "polluter pays" principle (Pearce et al., 1989).

- Triple-bottom-line (3P) means People, Planet, Profit. It is a three-legged model found by J. Elkington (1997). This concept is based on the principle "something is better than nothing". This principle underpins the concept of corporate sustainability. This approach is structured as a three-legged model, with its foundation built on the pillars of ecological, social, and economic sustainability. The practical implementation of corporate sustainability involves equating eco-efficiency with ecological responsibility, adhering to fundamental norms (such as enhancing working conditions, providing financial support, avoiding child labor and exploitation) to signify social sustainability, and recognizing economic sustainability as the sustained profitability of the enterprise in the long run (Elkington, 1997).
- Corporate social responsibility (CSR) "is the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large" (Watts & Holme, 1998, p. 6). CSR refers to the concept where companies voluntarily integrate social and environmental concerns into their business operations and interactions with stakeholders. The European Union recognizes that CSR can contribute to sustainable development while enhancing innovation and competitiveness. In the framework of CSR the responsible enterprise is seen as a part of the system, acknowledging the challenges of unsustainability, understanding the roles of governments and businesses in finding solutions, honestly assessing their impact on problems, and taking progressive steps towards a more sustainable world (Tóth, The Truly Responsible Enterprise—About Unsustainable Development, the Tools of CORP-ORATE Social Responsibility (CSR) and the Deeper, Strategic Approach, 2007).
- Blue economy. The World Bank (2017) describes it as "the sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the

health of the ocean ecosystem". In order for the blue economy to have a positive impact, it is crucial to recognize the distinction between traditional marine industries that operate in a conventional manner and those that are actively committed to achieving sustainability goals. In essence, the success of the blue economy as a positive force depends on distinguishing between environmentally responsible practices and standard business practices within the marine sector (Bryce, 2022).

The table 1 presents the comparison of those movements.

Table 1. Comparison of sustainability movements

Name	**Characteristics**		
	Focus	**Link to industries**	**Approach**
Circular economy	Sustainable resource use and waste reduction	Various industries and sustainable practices	Resource-efficient, waste-reducing practices
Recycling	Conversion of waste into useful products	Various industries, materials like electronics	Material reuse through conversion
Waste minimization	Decreasing hazardous waste	Waste-reliant industries like manufacturing	Minimize waste, promote reuse and recycle
Cleaner production	Preventive solutions	Across various industries	Prevent pollution and waste creation
Zero emission	Eliminating emissions	Automotive industry	Emission-free processes
Green economy	Sustainable economic growth and development	Economic system across industries	Sustainable economic growth and development
3P	People, planet, profit	Business practices, sustainability	Consideration of multiple pillars
CSR	Ethical and environmental integration	Ethical practices in business	Ethical practices in business
Blue economy	Sustainable use of ocean resources	Marine industries aiming for sustainability	Sustainable marine resource utilization

Source: own work.

Summing up the various concepts of sustainable economic and environmental practices discussed in the table showcase a range of approaches and focuses. Each concept presents a unique perspective on achieving sustainable outcomes across different industries. The circular economy emphasizes efficient resource use and waste reduction, recycling focuses on converting waste materials into useful products, waste minimization aims to decrease hazardous waste, cleaner production seeks preventive solutions to pollution, zero emission emphasizes emission-free processes, the green economy promotes sustainable economic

growth, the triple-bottom-line philosophy considers people, planet, and profit, corporate social responsibility integrates ethical and environmental considerations, and the blue economy revolves around the sustainable utilization of ocean resources. While these concepts share some common themes, they also possess distinctive characteristics that address specific environmental, economic, and social challenges. Also based on the literature, it is important to note that, while the circular economy offers numerous benefits, it also has disadvantages among which:

- increase in biological material production. Scaling up the production of biological materials could lead to changes in the Earth's surface, placing additional pressure on the planet's ecosystems and biodiversity;
- lack of proper control and regulations, without which large-scale recycling and reuse of materials could make people more vulnerable to toxic substances present in the recycled materials;
- unclear contributions to environmental and social sustainability;
- the sharing principle might inadvertently encourage people to opt for less environmentally friendly behaviors (for instance, personal car usage becoming more popular than public transportation). Additionally, the money saved through sharing methods could lead individuals to acquire and consume new products more actively.

Chapter 2. Methodology

A research methodology serves as a blueprint for conducting a particular research project. It outlines the strategies or approaches employed to gather and evaluate data related to a particular research subject. The essence of research methodology lies in the researcher's approach to structuring their study, ensuring the acquisition of accurate and dependable outcomes, and achieving the intended research goals: "research methodology is the philosophy or the general principle which will guide your research. It is the overall approach to studying your topic and includes issues you need to think about such as the constraints, dilemmas and ethical choices within your research" (Dawson, 2002, p. 14).

There are quantitative and qualitative research methodology:

- quantitative research is a systematic approach that employs principles from the natural sciences to gather and analyze data. This method focuses on generating numerical data and facts that can be quantified and measured using mathematical, computational, and statistical techniques. The primary objective of quantitative research is to establish a cause-and-effect relationship between variables, and it is often referred to as empirical research due to its emphasis on measurable observations. Quantitative research allows for the categorization and ranking of collected data, as well as measurement using standardized units. The use of graphs and tables aids in presenting and interpreting raw data effectively. The quantitative approach is characterized by its precision, accuracy, and ability to generate objective insights based on the analysis of numerical information (Lee, 1992);
- qualitative research is a valuable approach that focuses on understanding complex phenomena that quantitative methods might struggle to address. This method is unstructured and exploratory in nature, aiming to gain deep insights and comprehension of various aspects of human behavior, experiences, attitudes, intentions, and motivations. Qualitative research emphasizes participant perspectives and aims to capture the subjective nature of human reality. Additionally, qualitative research serves as a foundation for generating ideas and hypotheses that can later be investigated using quantitative research methods. This approach recognizes the

importance of individual perspectives and seeks to uncover not just what people do but also why they do it (Lee, 1992).

The researcher can choose one research strategy or a combine a few. By employing a mixed methodology, which combines both qualitative and quantitative research methods, can offer distinct advantages to a research project. By harnessing the strengths of both approaches, researchers can enhance the comprehensiveness of their study. This approach becomes particularly valuable when one method can offset the limitations or weaknesses of the other, ultimately leading to a more comprehensive and nuanced understanding of the research topic (Dawson, 2019).

Case study analysis can be considered a type of the research methodology which combines the tow above mentioned approaches. Case study holds value as a legitimate research tool across various social sciences disciplines, including social sciences directly related with our topic as economy, international business, management, foreign direct investment, and public policy. Selecting the right research method hinges on the nature of the research question and the methodological alignment. In this context, the case study method is notably well-suited for the current study. Based on the gathered information from the reports, statistics tools, publications regarding Cisco practices towards circular economy and sustainable development will be possible to generalize the data and reach theoretical conclusions.

Table 2. Advantages and limitations of case study method

Advantages	Limitations
Offers an in-depth and comprehensive viewpoint	Requires substantial time and resource
Shows how processes work over time, gives insights into cause and effect	Rich data can be complex to analyze
Explores, describes and explains	Data analysis heavily dependent on researcher's analytical skills
Complements statistical data and other sources	Difficulty in analyzing rich and complex data
Good at cross-border and cross-cultural research	Limited generalizability, not representative of entire populations

Source: own work based on (Young, 2007, p. 2)

There are a number of data collection methods available for a case study: surveys, interviews, focus groups, direct observations, documents and records (secondary data) (Yin, 2006). In this paper will be used the analysis of secondary data.

The subject of the research is the concept of a circular economy and the transition towards adopting circular economy principles for the purpose of business development. The primary focus is on understanding how the circular economy model can be implemented to foster business growth and sustainability.

The object of the research is Cisco. The research will examine how Cisco has embraced the principles of a circular economy, how they have transitioned their business practices to align with circular economy principles, and the impact of this transition on their business development strategies and outcomes.

The goal of this study is to analyze and assess the transition to a circular economy as a strategy for business development, focusing on the case study of Cisco.

The paper aims to understand the key drivers, challenges, and outcomes of Cisco's transition to a circular economy model and to provide insights that contribute to the broader understanding of circular economy adoption in the business context.

Hypotheses are the following:

H1: The transition to a circular economy positively impacts business development, leading to increased operational efficiency, reduced waste generation, and enhanced resource management for companies like Cisco.

H2: Cisco's adoption of circular economy principles has resulted in improved brand reputation, stakeholder engagement, and market positioning due to its commitment to sustainable business practices and innovative approaches to product lifecycle management.

H3: The case study of Cisco's transition to a circular economy provides valuable insights into the challenges and opportunities that companies face when implementing circular economy strategies, highlighting the role of cross-functional collaboration, technological innovation, and stakeholder alignment in successful adoption.

The research questions are:

1. How has Cisco implemented circular economy principles in its business operations and strategies?
2. What were the driving factors that led Cisco to transition to a circular economy model for business development?

3. What challenges did Cisco face during the transition to a circular economy, and how were these challenges addressed?
4. What specific benefits and outcomes has Cisco realized as a result of adopting circular economy principles for business development?
5. How does Cisco's case contribute to the understanding of the broader implications of circular economy adoption for other businesses?
6. What lessons can be learned from Cisco's experience that can guide other companies interested in transitioning to a circular economy model?

As for the plan of realization, the first step was to conduct a comprehensive literature review to understand existing knowledge on circular economy, its principles, benefits, challenges, and business implications, identifying achievements and gaps in literature and therefore research questions that need further exploration. The next step was to define the research methodology, justifying the chosen method. Then we identified data collection methods, creation of hypotheses and research questions. After that, we determined the sample size, selecting relevant reports, publications, and data related to Cisco's circular economy initiatives. Then, we came to outline the process of analyzing secondary data by categorizing and interpreting information from reports and publications. After taking the necessary steps, it was crucial to proceed to the main task, namely:

- to extract key insights and findings related to Cisco's circular economy transition;
- to interpret the analyzed data in the context of circular economy principles and business development;
- to discuss findings, referring to the literature review and research objectives;
- provide recommendations for businesses considering a transition to a circular economy model based on Cisco's case study.

Regarding ethical considerations, the study involves the accurate interpretation of data with proper attribution to the exact source of information and its proper citation, which, in this case, includes reports or other resources where the information was retrieved from.

Regarding the timeframe, since the study involves the analysis of secondary resources, the majority of time was dedicated to their examination. Over a period of 3 weeks, from July 15th to August 7th, an analysis of reports was conducted, and key themes were identified in order to subsequently proceed with writing the section containing a direct analysis of

programs and initiatives of the chosen company, namely Cisco. The reports covered the period from 2005 to 2022.

Chapter 3. Case study of Cisco and the role of Cisco in circular economy

3.1 Overview of Cisco

Cisco is an American company with 39-year history. The company was founded in 1984 by a married couple - Leonard Bosack and Sandra Lerner. At the time, the spouses were working at Stanford University. The company itself is named after the city of San Francisco (Cisco - a shortened version of the city's name). The company's logo accordingly depicts the well-known Golden Gate Bridge in San Francisco (Cisco, 2017).

Figure 4. Cisco logo (Source: Cisco, 2023)

Leonard Bosack personally wrote the software for a multiprotocol router, which became the company's first product. Already in February 1990, based on market capitalization, the total value of Cisco Systems' shares reached 224 million dollars, which exceeded the initially invested money by hundreds of times. Without much hesitation, the founders of Cisco sold their creation, receiving over 170 million dollars in returns. Venture investors handed over management positions to professional managers, after which the company continued its development. John Chambers assumed the position of the company's CEO (Alonso, 2022).

Cisco easily achieved success by producing routers that could connect computers with different network protocols. These routers stood out for their flexible operating system, which allowed firmware updates even for older models. As a result, the routers remained relevant for decades. From 1992 to 1994, Cisco Systems acquired a series of emerging companies, including Kalpana, Grand Junction, and Crescendo Communications. This marked a period of its flourishing. The faster the Internet developed, the more actively Cisco's products were sold. During that time, no internet service provider could do without a Cisco AS5200 access

server or Cisco Catalyst switches, which propelled Cisco Systems far ahead of its competitors (Alonso, 2022).

In May 2000, the company's employee count surpassed 44,000, with several thousand of them becoming millionaires. In the same year, Cisco's valuation reached 500 billion US dollars, propelling it to the top of the list of the world's most valuable companies. However, by 2001, this figure plummeted by more than fivefold. Quarterly results turned negative for the first time. The reason behind this decline was rooted in the company's internal economy. Cisco had been expanding at an exceedingly rapid pace, acquiring more and more companies. Experts assert that the crisis was inevitable, as if the company had continued growing at the same rate, within a decade Cisco's revenues would have equaled the entire US economy's (Carpenter & Lazonick, 2023).

The company took a series of actions to solve the situation. During that time, the company flooded the market with a significant portion of its produced equipment, selling it for only 6-7% of the actual price. As a result, demand for Cisco's products nearly vanished entirely. Nonetheless, the company's president, John Chambers, set his annual salary at just $1 and declared that it would remain so until Cisco Systems recovered. Simultaneously, there was a decision to focus more on technological innovations and the needs of their own customers. For instance, in 2001, Cisco introduced a cutting-edge model of an optical switch for the telecommunications company Bell South, and in 2003, the company sponsored the first wireless Wi-Fi IP phone (Carpenter & Lazonick, 2023).

Currently, Cisco Systems, Inc. manufactures a wide variety of network and communication devices, including Ethernet switches, routers, products for IP telephony (IP PBX, VoIP gateways), firewalls, concentrators, optical switching platforms, cable modems, DSL equipment, data storage network switches, and network management software. Additionally, Cisco provides certification for networking professionals in eight areas. The primary trend in industry development and Cisco's strategy is described as follows: the emphasis is not on connecting "computer to computer", but on communication "human to human".

In figure 5 is depicted Cisco's worldwide revenue from 2006 to 2023. As it is seen, in 2023 company has already reached the highest point and this data will be actualised by the end of this year. In addition, a significant portion of Cisco's revenue, approximately 50%, was

attributed to its “Secure, agile networks” division. Meanwhile, around 9% of its total revenue was derived from the “Internet for the Future” segment. Specifically, Cisco’s “Secure, agile networks” division generated approximately 29,1 billion US dollars in revenue, while the “Services” segment contributed an additional 13,86 billion US dollars in revenue (Alsop, Revenue Cisco Systems 2006-2023, 2023).

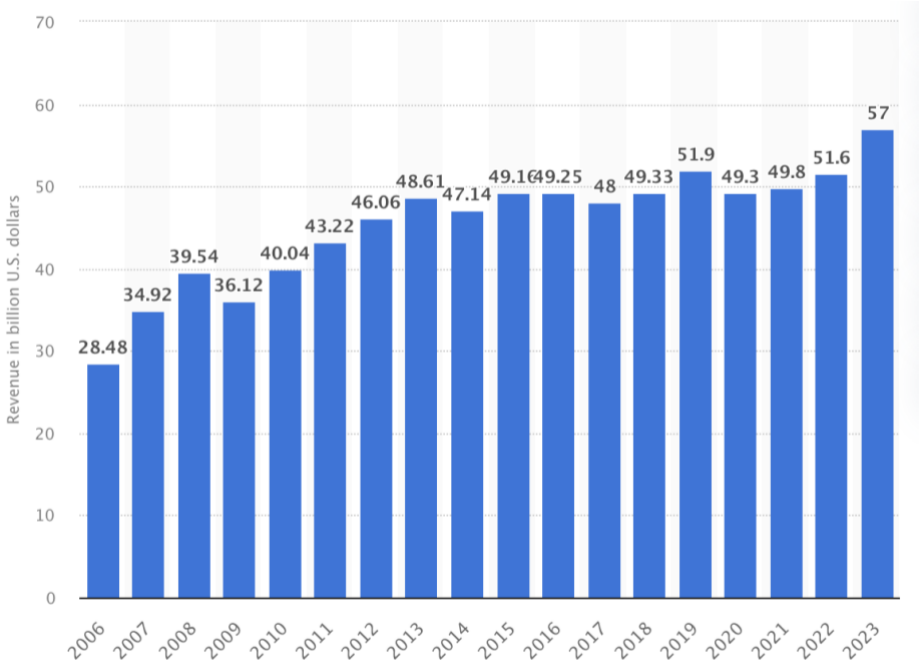

Figure 5. Cisco revenue worldwide 2006-2023 (in billion US dollars) (Alsop, Revenue Cisco Systems 2006-2023, 2023)

In figure 6 is presented the number of employees at Cisco by geographic region from fiscal year 2010 to 2022. Cisco Systems had 83,300 employees according to the most recent data, on July 30, 2022.

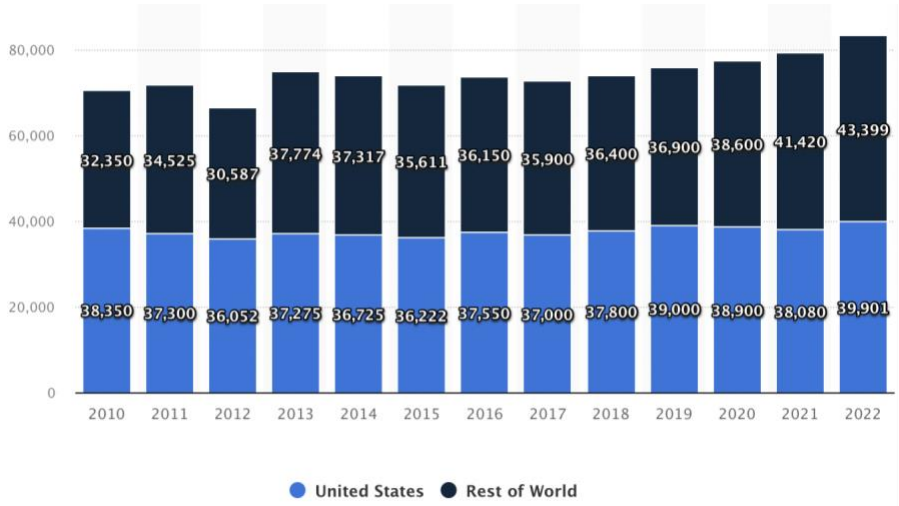

Figure 6. The number of employees at Cisco (Alsop, 2022)

Cisco holds a global patent portfolio comprising 34,991 patents, with 23,661 of them having received official grants. Over the course of its 39-year history, Cisco has successfully secured more than 7,000 patents. Below, figure 7 presents the map to illustrate in which counties Cisco holds patents, and in table 3 there are a total number of patents by country (Insights, 2023).

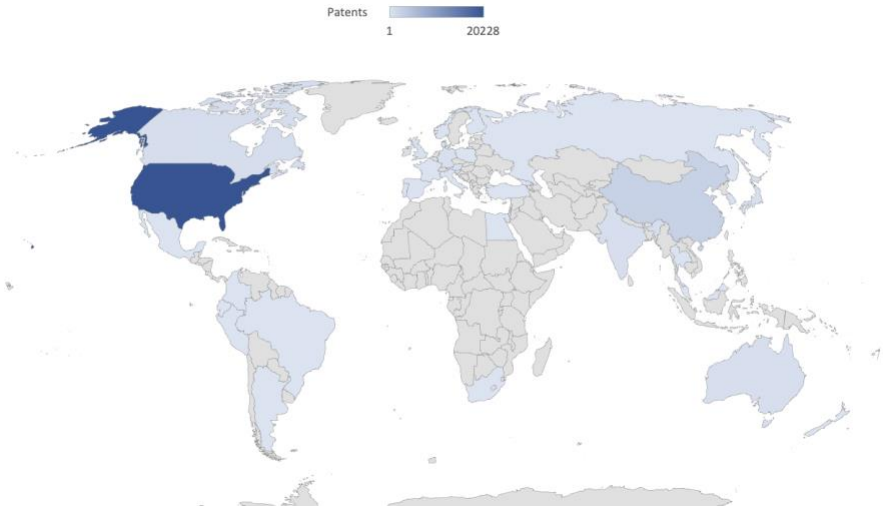

Figure 7. Cisco's patent map (own work based on Insights, 2023)

Table 3. List of countries with patents

Country	**Patents**	**Country**	**Patents**
United States Of America	20228	Russian Federation	13
Europe	3721	Portugal	11
China	2378	New Zealand	10
Canada	747	Poland	8

India	640	France	6
Australia	542	Argentina	4
Japan	416	Peru	4
Germany	355	Turkey	4
Austria	323	South Africa	3
United Kingdom	317	Cyprus	2
Korea (South)	315	Italy	2
Israel	233	Malaysia	2
Norway	117	Ecuador	1
Spain	71	Colombia	1
Mexico	52	Egypt	1
Singapore	49	Slovenia	1
Hong Kong (S.A.R.)	46	Georgia	1
Taiwan	42	Finland	1
Brazil	35	Thailand	1
Denmark	16		

Source: (Insights, 2023)

This achievement is a result of the collective effort of its dedicated employees, who have contributed nearly one million person-hours to advance technology for the global community's benefit. Cisco's remarkable success in the global information and communication technology market can be attributed to its unwavering commitment to innovation, customer-centricity, and upholding principles of corporate social responsibility. According to the information above, Cisco provides the highest quality services in its industry sector. Their products are sold in nearly every country around the world, serving both individual consumers and large corporations. All of these factors indicate that Cisco's performance seems to be quite favorable.

3.2 Cisco's initiatives and programs implemented

Based on data such as company reports from the early 2000s, published articles, and interviews over the last 20 years, the company has always aimed to contribute to sustainable development and environmental support. It has worked towards reducing its carbon footprint by involving customers, partners, and employees in initiatives to manage their environmental impact, as well as by developing IT solutions to address climate change issues. Since 2005, the company has been reporting its greenhouse gas emissions. In 2010 Cisco became a founding member of the Ellen MacArthur Foundation (EMF) which develops and promotes the idea of a circular economy.

The environmental strategy adopted by the organization employs a comprehensive approach that considers both direct and indirect consequences. Three primary domains receive emphasis:

- Low-carbon solutions: innovating approaches that aid both Cisco and its clientele in minimizing energy consumption and curtailing carbon footprints.
- Products: enhancing the energy and resource efficiency of products throughout their life cycle, from design and manufacturing to utilization and disposal.
- Operations: enhancing resource efficiency and altering operational methodologies.

Cisco has both near- and long-term goals. Cisco plans to reduce Scope 1 and 2 GHG emissions to 90% by 2025. Scope 1 includes direct emissions from owned or controlled sources, while Scope 2 includes indirect emissions from the generation of purchased electricity, steam, heating, and cooling, and Scope 3 includes emission from air travel and transportation.

Cisco aims to achieve a reduction of 30% in Scope 3 emissions, which encompass emissions associated with purchased goods and services, upstream transportation and distribution processes, and the utilization of sold products. This reduction is targeted to be accomplished by the year 2030. The specified goal for Cisco is to achieve net zero greenhouse gas (GHG) emissions throughout its entire value chain by the year 2040.

To reach all these goals Cisco plans by:

- increasing energy efficiency of its products and solutions. This entails designing and developing technology that consumes less energy during its lifecycle, thereby reducing the emissions associated with energy consumption;
- by further embedding circular economy principles across Cisco's business, aiming to enhance resource efficiency and minimize waste generation;
- by accelerating the use of renewable energy, aiming to reduce carbon footprint and reliance on non-renewable energy sources;
- by embracing hybrid work, aiming to reduce commuting-related emissions and promote a more flexible and sustainable work environment;
- by investing in innovative carbon removal solutions, aiming to contribute to offsetting carbon emissions and advancing climate mitigation efforts (Cisco, 2023).

In 1997 Cisco launched the Cisco Networking Academy. Since that time more than 17,5 million students have graduated from the course. During the course students are taught to build greener solutions and to prepare students to the new future-ready workforce with sustainability oriented environmental data scientists, energy analysts, environmental consultants, and chief sustainability officers (Hameed, 2023).

In 2006 Cisco launched the Connected Urban Development (CUD) program in cooperation with Amsterdam, San Francisco, and Seoul. The aim of this initiative is to reduce greenhouse gas emissions by changing the way of services delivery in urban environments (Cisco, 2008). Since 2010, this program has been managed by non-profit organization – the Climate Group.

Since 2013 Cisco has created Green Team Network (CGTN) to drive social and environmental change both at work and in homes of company's employees. This initiative encourages workers to help company to become more sustainable and to make world a better place. This network works with local non-profit organizations to reach the mission to build a more sustainable environment for surround communities. The actions taking by this network include tree planting, wildflower seed collection, fence installation, trails and habitats, and biodiversity promotion (Hart-White, 2023). Since the Cisco Green Team Network was established, it has achieved the following initiatives:

- eliminated paper cups from selected Cisco buildings in India, Europe, and the U.S.;
- established a community garden in San Jose, California;
- created an urban farm at the Diegem, Belgium, site;
- designed and installed shadow boxes above waste receptacles in San Jose and RTP cafeterias to aid employees in effective waste sorting;
- received Cisco's Excellence in Environmental Stewardship award in December 2017 (Boynton, 2020).

Additionally, Cisco educates employees about sustainability programs and current engagement opportunities, such as Open Conservation and SustainX, part of the annual Earth Aware campaign. Employees have access to various learning platforms, including:

- Cisco Green: an internal social media hub that provides information about the company's environmental sustainability efforts;

- Cisco GreenHouse: an interactive web platform launched in 2016 for employees to connect and collaborate on leading more sustainable lives. Over 2,800 employees had joined the platform by the end of 2019, taking around 20,000 sustainable actions;
- Circular Economy Newsletter and Learning Series: launched in 2019, these resources aim to raise awareness and inspire employees to contribute to Cisco's circular economy transformation. They share project successes, training, and videos related to sustainability.

In 2016 Cisco made first volunteer campaign among employees named "Earth Aware". Since that time each year during a whole month (April) employee all over the world participate in such events as tree planting, beach clean-ups, recycling seminars (Paquette, 2018).

The ame year Cisco announced the Cisco Global Problem Solver Challenge, a competition aimed at recognizing and supporting early-stage technology start-ups that present innovative solutions to address critical social and environmental issues globally. The competition offers cash prizes, with a total prize fund of 1 million US dollars. Cisco's commitment to contribute 100 million US dollars over the span of 10 years through The Cisco Foundation, which is the company's CSR division. This funding are allocated to provide grants to non-profit organizations and to support impact investing initiatives that focus on climate solutions (Hope, 2022).

In 2022 Cisco has launched Environmental Sustainability Specialization, which focuses on educating and certifying Cisco partners who assist their clients in responsibly repurposing or recycling products that have reached the end of their use. The unique aspect of this program is that partners are only required to contact Cisco to arrange the collection of their customers' outdated hardware. The solution provider does not need to handle the refurbishment or recycling process themselves (Narcisi, 2022).

Once partners earn a specialization related to sustainability, they can take advantage of Cisco's Takeback Incentive, which offers discounts on new products. This initiative aims to motivate both Cisco partners and their end customers to recycle outdated IT gear instead of disposing of it in landfills. Cisco's Takeback program handles hardware that is returned, either refurbishing and recycling it or incorporating it into the Cisco Refresh program, which offers

certified remanufactured equipment at discounted prices with the same warranty and support options as new products. The company strives for sustainability by ensuring that the vast majority of returned hardware is either refurbished with new components and warranty or securely decommissioned and recycled (Narcisi, 2022). Furthermore, Cisco is planting a tree for each new individual trained on sustainability by a partner organization.

3.3 Cisco's commitment to sustainable development

In this section of the paper, Cisco's achievements within the programs and initiatives listed in section 3.2 will be presented. To assess the effectiveness of various actions, it is necessary to compare data from reports and statistics.

Cisco implemented practices to reduce its environmental impacts (Table 4). During 2006-2010 fiscal years Cisco worked on increasing the number of sites with ISO 14001 Environmental Management Systems (EMS) certification, which indicates the company's commitment to environmentally responsible practices. The percentage of employees covered by the ISO 14001 EMS decreased slightly from 75% in FY06 to 68% in FY10. This could be due to changes in the employee base or the scope of EMS implementation.

The table below presents gross GHG emissions in metric tons of CO2 equivalent for Scope 1 and Scope 2 emissions. Scope 1 includes direct emissions from owned or controlled sources, while Scope 2 includes indirect emissions from the generation of purchased electricity, steam, heating, and cooling. The distinction between total gross and total contractual GHG emissions for Scope 2 is shown. Total contractual emissions reflect emissions associated with purchased electricity. Total gross GHG emissions for Scope 1 increased from 27,586 metric tons CO2e in 2006 to 53,363 in 2010, indicating a significant rise over the five years. Total gross GHG emissions for Scope 2 also increased, from 317,666 to 597,257. There is a decrease in total contractual GHG emissions for Scope 2 from 2006 to 2009, followed by an increase in 2010. The reduction in 2008 could be attributed to changes in energy sourcing or efficiency efforts. The total contractual GHG emissions for Scope 1 and 2 show fluctuations, with a noticeable reduction from 2006 to 2008 and then an increase in 2010. Cisco's performance in reducing Scope 3 air travel emissions against specified goals shows a mix of positive and negative outcomes. While the company exceeded the reduction

goals in some years, there were instances where emissions increased compared to the baseline years.

The other data provided in the table indicates a mixed performance in several key environmental indicators for Cisco over the five fiscal years. There was a consistent upward trend in energy and electricity usage, highlighted the need for energy efficiency measures. On the other hand, the decreasing percentage of materials sent to landfill from returned products suggested a positive effort in waste reduction and recycling. The fluctuations in water consumption suggested that the company's water management practices might not have shown a clear linear trend over this period.

Table 4. Results of Cisco's environmental practices 2006-2010

INDICATORS	**2006**	**2007**	**2008**	**2009**	**2010**
Environmental Management					
Number of Cisco sites with ISO 14001 EMS	19	25	25	26	26
Employee base covered by ISO 14001 EMS	75%	73%	71%	68%	68%
GHG Emissions					
Scope 1 (metric tonne CO2e)	27,586 (3)	51,399	51,661	53,453	53,363
Scope 2 (metric tonne CO2e)	317,666 (3)	461,456	539,867	590,755	597,257
Total contractual (1) GHG emissions: Scope 2 (metric tonne CO2e)	316,893 (3)	397,167	300,516	235,520	339,640
Total contractual (1) GHG emissions: Scope 1 and 2 (metric tonne CO2e)	535,419 (3)	448,566	352,177	288,973	393,003
Scope 1 and 2 reduction goal and performance Change in Scope 1 and 2 from FY07 EPA global goal: 25% absolute reduction against CY07 baseline (2)			-22% (goal for 2012)	-36% (goal for 2012)	-12% (goal for 2012)
Total air travel GHG emissions: Scope 3 (metric tonne CO2e)	190,940	205,796	197,867	118,602	104,937
Scope 3 air travel reduction goals and performance: 1. Change in air travel GHG emissions from FY06 CGI global goal: 10% absolute reduction against FY06 baseline 2. Change in Scope 3 air travel from FY07 EPA global goal; 25% absolute reduction against CY07		+8%	+4%	-38% (both goals met)	-45% (both goals met)

baseline (2)					
Energy and Electricity Use					
Energy usage (GWh)	889 (3)	1282	1438	1533	1524
Electricity usage (GWh)	749 (3)	1054	1203	1293	1296
Product Return and Recycling					
Product return (metric tonnes) (4,6)			10,030	10,730	8580
Materials to landfill (percent of returned product not reused or recycled) (4, 5)			0,46%	0,44%	0,333%
Water Consumption					
Total water consumption (m3) (7)		1,725,618	1,547,025	1,455,662	1,492,297

Source: own work based on Cisco, 2010.

From 2015 till 2021, the company has successfully carried out more than 440 energy efficiency initiatives aimed at cutting down on expenses and emissions. Presently, the company is in the process of creating more advanced thermal systems that are projected to lower energy wastage while upholding enhanced efficiency standards (Cisco, 2021). Cisco has managed to curtail 60% of its combined direct and indirect emissions encompassing Scope 1 and 2, which account for elements such as corporate vehicles and heating or cooling infrastructure. The company aspires to attain complete carbon neutrality, encompassing Scope 3 emissions as well (Cisco, 2021).

In 2015 Cisco spent 16 million US dollars on energy efficiency and renewable energy initiatives (Cisco, 2015). In 2017 Cisco reported it reached the 5-year GHG reduction by 40% in Scope 1 and 2. Number of Cisco sties with ISO 14001 EMS grew to 30 (Cisco, 2017).

The table 5 provides data for various indicators related to greenhouse gas emissions and other environmental factors over the years 2013 to 2017. As it is seen, the emissions from direct sources were 55,811 in 2013, decreasing to 41,914 in 2017. There was a significant reduction of 25% over the period. Indirect emissions (Scope 2) reached 736,064 in 2017, with a slight increase from 2013 (666,373). However, there was a decline in the intermediate years before the slight rise in 2017. Including renewable energy, Scope 2 emissions were 471,819 in 2013, decreasing to 221,430 in 2017. This represents a substantial reduction of 53% over the period. Total emissions (Scope 1 and 2) declined from 527,630 in 2013 to 263,344 in 2017, marking a significant 50% reduction. The percentage change over the years shows positive progress in reducing emissions, except for a decline in progress in 2016 followed by a significant increase in 2017.

The savings in estimated annual CO2 emissions varied, with the highest reduction in 2016 (22,500 metric tonnes CO2e) and an increase in 2017 (23,600 metric tonnes CO2e). Scope 3 emissions experienced fluctuations, reaching the highest in 2017 (184,199 metric tonnes CO2e) after a relatively steady increase.

There was steady growth in the use of electricity from renewable sources, with the highest increase in 2017 (80% progress). Electricity usage increased from 749 GWh in 2013 to 1296 GWh in 2017. Water consumption slightly increased over the years, with a peak in 2017 (2252 thousand m3).

Table 5. Results of Cisco's environmental practices 2013-2017

INDICATORS	**2013**	**2014**	**2015**	**2016**	**2017**
GHG Emissions					
Scope 1 (metric tonne CO2e)	55,811	49,721	45,562	53,123	41,914
Scope 2 (metric tonne CO2e)	666,373	704,756	731,103	731,662	736,064
Scope 2 (metric tonne CO2e), include renewable energy purchases	471,819	497,581	318,890	247,933	221,430
Total GHG emissions: Scope 1 and 2 (include renewable energy purchases), metric tonne CO2e	527,630	547,302	364,452	301,057	263,344
Percent progress	+16,6%	+20,9%	-19,1%	-33,2%	46,1%
Total estimated annual CO2 e savings, metric tonne CO2 e/yr	34,000	12,000	22,500	12,400	23,600
Total Scope 3 air-travel GHG emissions, metric tonneCOe	133,130	149,617	181,123	184,199	177,210
Electricity from renewable sources, GWh	523	579	1167	1264	1316
Percent progress	34,4%	36,8%	71,3%	77%	80%
Electricity usage (GWh)	749 (3)	1054	1203	1293	1296
Total water consumption (m3), thousands (include potable water and recycled irrigation)	1969	2020	2138	2252	2223

Source: own work based on Cisco, 2017

The table 6 presents emissions data for three Scopes over a span of four years, from 2019 to 2022. Scope 1 emissions decreased from 47,276 in 2019 to 34,931 in 2022, reflecting a significant reduction over the period. Location-based Scope 2 emissions displayed a declining trend, from 651,331 in 2019 to 564,012 in 2022. This indicates a steady effort to reduce indirect emissions associated with purchased electricity. Similar to location-based emissions, market-based Scope 2 emissions also showed a decline. These emissions decreased from 187,428 in 2019 to 108,373 in 2022, indicating a trend of reduced emissions from purchased energy sources. Scope 3 emissions encompassing various indirect emissions exhibited a gradual decline from 26,472,706 in 2019 to 17,837,665 in 2022. This highlights an

ongoing effort to mitigate emissions across the value chain, including those related to upstream and downstream activities.

Table 6. Cisco's emissions data 2019-2022 metric tonne CO2e

Emissions category	2019	2020	2021	2022
Scope 1 emissions	47,276	38,743	26,694	34,931
Scope 2 location-based emissions	651,331	607,218	579,445	564,012
Scope 2 market-based emissions	187,428	163,645	147,801	108,373
Scope 3 emissions total	26,472,706	21,534,170	20,390,529	17,837,665

Source: own work based on Cisco, 2023.

In order to provide a more visual representation of the data presented in the tables, graphs 8 and 9 have been prepared. Figure 8 illustrates the trend in reducing emissions in Scope 1 from 2013 to 2022. Figure 9, on the other hand, depicts the dynamics of Scope 2 emissions for the years 2013 to 2022, respectively.

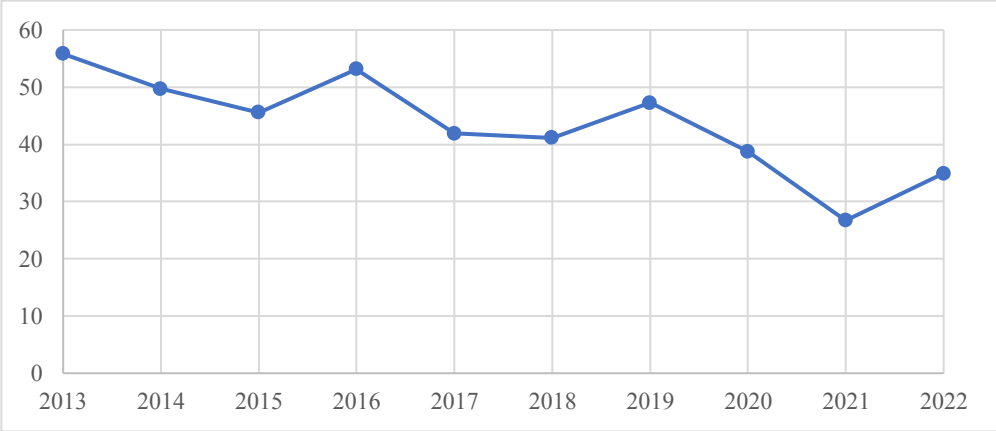

Figure 8. Scope 1 (metric tonne CO2e) 2013-2022

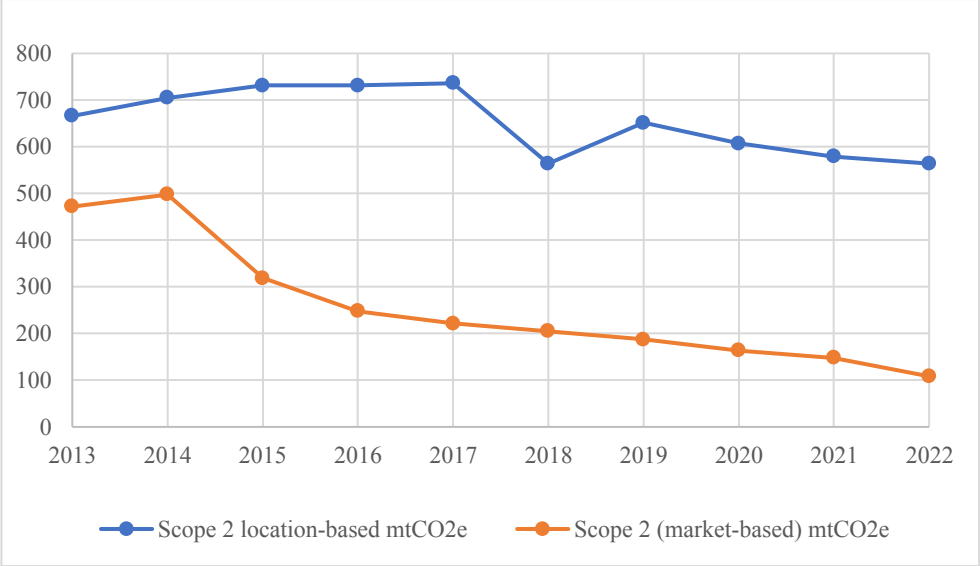

Figure 9. Scope 2 (metric ton CO2e) 2013-2022

Furthermore, figures 10 and 11 display data regarding operational energy usage for the recent period, specifically from 2018 to 2022. Cisco's natural gas consumption has decreased steadily over the years, starting at 90 GWh in 2018 and gradually declining to 46 GWh in 2022. This indicates a decreasing reliance on natural gas for their energy needs. The stationary diesel usage shows some variation but remains relatively consistent. It was 21 GWh in 2018, decreased to 10 GWh in 2021, and then increased slightly to 18 GWh in 2022. Cisco's transportation fuel usage fluctuated during this period. It started at 65 GWh in 2018, increased significantly to 86 GWh in 2019, decreased to 62 GWh in 2020, dropped further to 47 GWh in 2021, and then rose to 75 GWh in 2022.

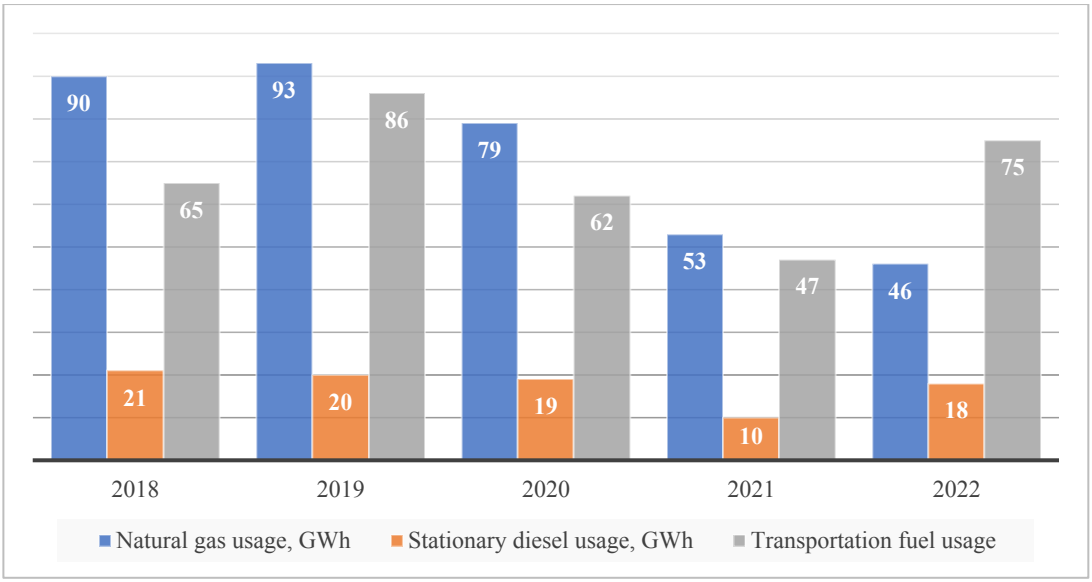

Figure 10. Operational energy usage 2018-2022

Cisco's total energy usage has shown a slight decrease from 1815 GWh in 2018 to 1629 GWh in 2022. Indirect energy usage, which typically includes purchased electricity, follows a similar pattern of decrease from 1637 GWh in 2018 to 1489 GWh in 2022. Direct energy usage, which may encompass on-site electricity generation and other direct energy sources, has experienced some fluctuations. It started at 178 GWh in 2018, increased to 201 GWh in 2019, then decreased to 162 GWh in 2020, dropped further to 109 GWh in 2021, and then increased again to 140 GWh in 2022.

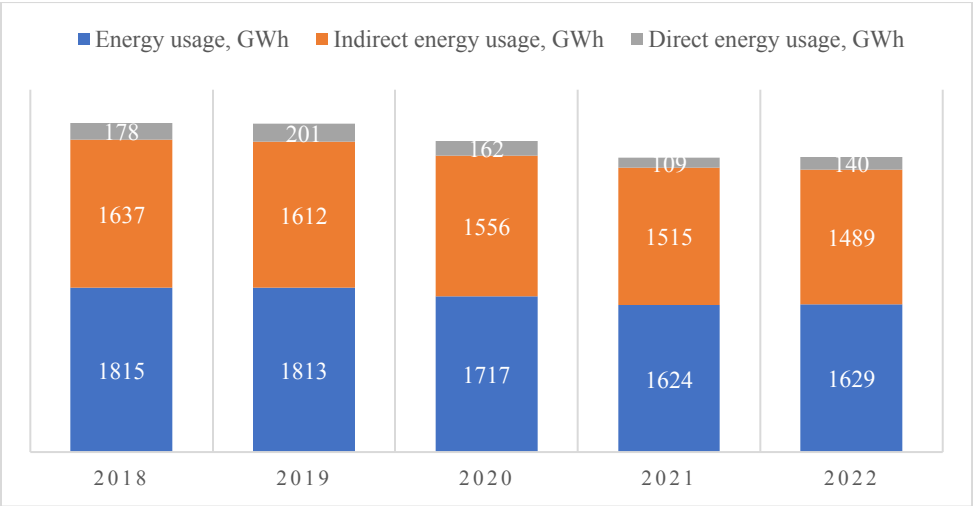

Figure 11. Operational energy usage (electricity) 2018-2022

To conclude, Cisco's made efforts to diversify its energy sources and reduce natural gas consumption. However, the consumption of stationary diesel and transportation fuel has experienced some fluctuations over the years. Cisco also has made efforts to reduce its total energy usage and has been successful in decreasing its indirect energy usage. However, direct energy usage has shown some variation over the years.

All these data suggests that the company has been making consistent efforts to reduce its emissions across various scopes, resulting in a positive trend of decreasing emissions over the specified time period. This reflects the company's commitment to environmental sustainability and emission reduction strategies.

Cisco shifts to renewable energy, for now 72% of their data centres use it. Cisco offers energy-efficient solutions through its Silicon One chip, which assists customers in minimizing power consumption. Furthermore, Cisco's smart building solutions involve low-voltage Power over Ethernet (PoE) smart switches. These switches enable network-based monitoring and control of various building attributes such as temperature, lighting, air quality, and other factors, ultimately helping customers to reduce their energy consumption in their buildings (Cisco, 2023).

As part of its circular economy strategy, Cisco plans to integrate circular design principles into all of its new products and packaging by 2025. In 2019 Cisco was awarded by the Center For Climate and Energy Solutions for efficiency in greenhouse gas management (ICMR, 2021). In 2021 SG Analytics put Cisco on the 10th place the ranking of most

sustainable company. In 2023 Cisco ranked the 4th after Schneider Electric, Ørsted, and Nvidia (SG Analytics, 2023).

3.4 Integration of circular economy principles

The aforementioned data demonstrates how the company approaches sustainable development responsibly and acknowledges the significant contribution it is capable of making. However, the company's primary goal is to achieve the core principle of the circular economy, namely "reusing, repairing, refurbishing, and recycling" for all Cisco products. It is towards this goal that the company's efforts are directed. To achieve this goal, the company actively involves stakeholders, employees, and customers, believing that collective efforts can make the world a much better place much faster. Since 2000, the company has been actively striving for products to be reused and recycled, contributing to the prevention of thousands of tons of IT equipment from being discarded into worldwide landfills.

In 2015 Cisco's customers returned 11 718 metric tonnes of products to reuse and recycling, 25% of this amount was resold, refurbished or reused. Same year Cisco spent 16 million US dollars on energy efficiency and renewable energy initiatives (Cisco, 2015).

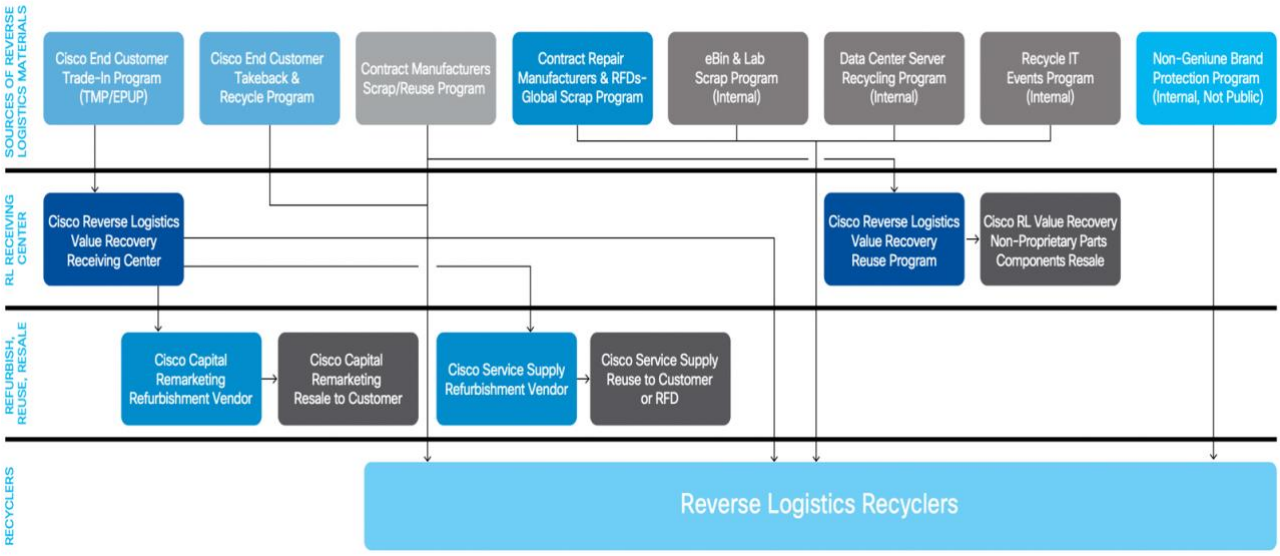

Figure 12. Reverse logistics material sources and flow of materials for reuse and recycling (Cisco, 2018)

In 2017 Cisco reported it reached the 5-year GHG reduction by 40% in Scope 1 and 2. Company received between 11 000-14 000 metric tonnes of products to reuse and recycling, 25-35% of this amount was resold, refurbished or reused. Number of Cisco sties with ISO 14001 EMS grew to 30 (Cisco, 2017).

Cisco CEO Chuck Robbins made a commitment to sustainability and the circular economy at the 2018 World Economic Forum. Robbins outlined the steps Cisco planned to take, such as creating new business models based on circular economy principles. Company admitted the need for coordination and collaboration across different departments within the company, including operations, sales, marketing, and sustainability. Cisco initiated the Circular Economy Executive Change Network, consisting of 10 senior thought leaders, to support these objectives. The network aimed to integrate circular design principles into all new Cisco products by 2025 (Cisco, 2018).

To reduce the environmental impacts Cisco minimized use of potentially hazardous materials in their products design, its packaging and even transportation. Certain materials utilized in electronic components could potentially present health and environmental hazards if not managed or discarded properly. Cisco is actively working to remove these substances from their products and explore dependable substitutes through Product Materials Management initiative. Additionally, company's take-back initiatives promote the responsible disposal of products, thereby preventing the leakage of hazardous substances into groundwater. Through adjustments to its line card packaging, Cisco succeeded in minimizing the amount of foam cushioning employed. This optimization enabled a reduction in the dimensions and weight of the outer corrugated box (Girrbach, 2011). This single alteration is projected to result in a preservation of over 180 tons of materials. Cisco strategy can be described as follows:

- shifting from single packs to multi-packs whenever possible to optimize transportation footprint;
- eliminating the use of wood pallets in packaging;
- transitioning from shipping individual units to shipping products that are already assembled and configured;
- using a single carton to replace 13 separate packages for a high-end router, aiming to reduce packaging weight by over 60%;

– consolidating packaging in two phases, with the first phase involving technical work before a full rollout.

Those measures helped Cisco to reduce packaging weight by 40% and costs by 55% for each shipment. Company also discontinued to add printed instructions and documentation to each purchase, they replaced it with online sources, which also easy to update if some information gets outdated.

Cisco utilizes packaging materials with recycled content when possible, specifically highlighting the use of corrugated cardboard with approximately 50% recycled content. Recyclable polyethylene bags are employed for various purposes. The company has also introduced thermoformed cushions made from 100% recycled polyethylene in recent years. However, the text also acknowledges that while Cisco strives to adopt environmentally friendly options, not all applications have sustainable alternatives. For instance, thermoformed cushions cannot be used for all products, leading some products to still rely on foam cushions. Similarly, ESD (Electro Static Discharge) bags are still in use. In such cases, Cisco focuses on minimizing material usage and is exploring the possibility of an internal reuse program.

Cisco mandates that its suppliers adhere to the Controlled Substances Specification, a document outlining substances either prohibited for usage or necessitating reporting if incorporated into Cisco products. These substances encompass those limited by the EU RoHS Directive and other regulatory frameworks, alongside substances that, although not subject to regulation, Cisco aims to reduce, including brominated flame retardants (BFs) and polyvinyl chloride (PVC).

Another initiative towards circular economy is to reach a net zero target by 2040 (Cisco, 2021). In 2019, Cisco made a commitment to decrease its consumption of new plastic materials by 20%. After that announcement the company raised this target to utilizing 50% recycled plastic in its products by 2030. To reach all those goals Cisco has dedicated a special circular economy team, citing Chief Sustainability Officer, Mary de Wysocki: “That means the energy in our buildings, vehicles, and emissions we attribute to products that customers use — that’s about 73% to 75%. The other 23% to 25% [is] coming from our partners [and] our suppliers in how we manufacture that embedded carbon” (Mearian, Corporate execs confident on sustainability goals, admit more work needed, 2023).

Cisco's waste reduction and recycling program are fundamental components of its ISO 14001 certification and global environmental policy. It emphasizes Cisco's commitment to minimizing waste across its facilities by promoting the principles of reduce, reuse, and recycle. In the fiscal year 2022, Cisco achieved a significant milestone by diverting approximately 75% of the waste generated at facilities away from landfills on a global scale. The table 7 and figure 13 present a dynamic analysis of Cisco's recycling efforts and waste management practices over a five-year period, from 2018 to 2022.

Table 7. Cisco's waste operations 2018-2022 (metric tonne)

Year	Municipal recycling	Composted	Hazardous waste	Waste sent to landfill
2018	6292	808	617	2842
2019	6683	1180	617	2018
2020	2296	1945	255	1072
2021	730	438	76	568
2022	852	691	248	611

Source: own work based on Cisco reports.

It is important to note that the fluctuations are not indicative of poor performance but rather reflect the company's commitment to waste reduction and sustainable waste management practices.

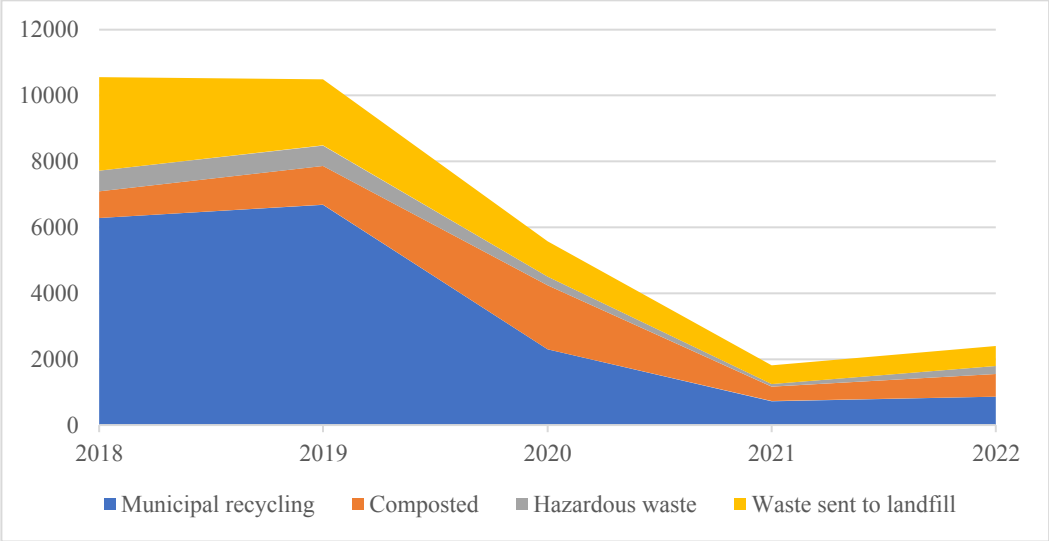

Figure 13. Recycling (in metric tonne)
(own work based on Cisco reports)

Among circular economy pillars are also employment policies and land development. Cisco works on to make their workplaces support employees wellbeing and productivity by:

- optimizing company's portfolio for hybrid work, which in a positive way influences employees' well-being (based on company research);
- increasing sustainability of real estate operations, this means the abandonment of unused space is due to the hybrid system. In turn, the company designs its offices with consideration for all aspects important for the environment. For instance, 22% of the company's buildings hold certifications such as LEED, CASBEE, BREEAM, and a range of other green certificates that are currently in the process of validation. Cisco is actively working to increase the number of such buildings in its portfolio to minimize its environmental impact;
- sourcing renewable energy for global operationsю Properly designing office workspaces and servers, in turn, reduces electricity consumption and GHG emissions. In 2022, the company implemented 34 projects aimed at improving energy efficiency, which will allow for the avoidance of approximately 14.5 GWh of energy consumption and 8000 metric tonnes of CO2e emissions annually;
- engaging stakeholders, customers, employees, partners on sustainability strategy.

Additionally, all company-owned vehicles are gradually being replaced with electric ones. At present, 40% of the company's registered vehicles provided to employees are electric. While Cisco does not use water for its operations, they are also working to reduce its consumption. Consequently, the company utilizes recycled water for lawn irrigation and cooling purposes in its largest hubs.

In this subsection, additional measures implemented by the company in line with the principles of the circular economy have been presented. Through the process of comparison and data collection, a wealth of information regarding the company's strategy and actions has been found. All of this will be summarized in the following section.

Chapter 4. Major findings and discussion

As noted in the theoretical part, there is currently no single definition of the circular economy that can be used to consider and analyze the actions of all companies. Many definitions overlap with other concepts, which were also listed in the theoretical part of this paper. However, in the field of ecology and sustainable development, it is impossible to single out one specific concept, as every action aimed at improvement is essential. From the theory, it follows that the key principles of the circular economy are "reduce, reuse, recycle". According to these principles, an analysis of Cisco's actions and strategies was conducted. During the analysis, it became clear that the company's actions can be categorized into areas listed below within which it implements its policies:

- economic development;
- education;
- employment policies;
- energy;
- land development;
- sustainable development;
- training;
- transport.

It is worth adding that despite Cisco's successful implementation of its strategies and its confident assertion of achieving all its long-term goals within the specified periods, it falls within the 40% of companies that are also optimistic about reaching their objectives. Including Cisco, 700 companies out of 2000 have made statements regarding net-zero commitments by 2050. However, there are 22% of companies that are extremely pessimistic about achieving their 2030 goals for energy evolution and efficiency (Mearian, 2022). As the L.E.K Consulting (2022) survey shows many companies will struggle to deliver those commitments, the reason is "the more that leaders try to operationalize sustainability, the more they find their organizations are ill equipped for the task — out of alignment and lacking essential skills and metrics" (Goddard, 2022).

According to McKinsey's (2022) leaders must take significant steps to respond effectively to the current situation. This includes quickly acquiring knowledge about climate

technology, actively participating in the innovation community, and making the most of their engineering and business development expertise. Business executives have the opportunity to proactively engage in biodiversity efforts. This includes overseeing the responsible management of shared water and air resources, ensuring an ethical supply chain, and actively contributing to a fair transition, among various other initiatives (McKinsey, 2022). As organizations embrace a sustainable future, there is a pressing need to develop fresh skill sets. This entails actively retraining leadership teams, boards, and frontline employees. Companies have to pinpoint the specific skills required for their evolving sustainable business models and make concerted efforts to both obtain and cultivate them from within. Companies also may need to use sustainable IT software to automate the process of gathering and analysing data, which will help them to save time and reduce the errors. These data can be used to monitor changes and needs to make actions towards sustainability and circular economy (Violino, 2022).

Experts say that modern companies have to relocate their capital, transitioning away from "high-emission technologies currently in use, such as fossil-fuel-based power generation, and redirecting it toward low-emission technologies like renewables" (Mearian, 2022). There is an opinion that modern companies have to translate sustainable goals and make their progress as more demonstrable as they can to survive on the market (Haanaes & Olynec, 2022).

Among the benefits companies of achieving sustainable goals are the potential financial returns associated with reduced energy costs, the role of such investments in mitigating the catastrophic effects of climate change, and the opportunities for growth, job creation, and inclusivity that come with transitioning to a more sustainable and decarbonized economy (World Economic Forum, 2022).

There are three broad categories in which efforts to achieve sustainability goals are typically concentrated: green resources procurement (such as sustainable energy and water), operational efficiency (including measures within the IT and supply chain), and end-of-lifecycle considerations (involving circular economy principles and recycling). In the IT department is becoming popular to focus on data centers and cloud industries, which prioritize green energy procurement and operational efficiency to reduce energy consumption (Sunil, 2023). For example, Reem Asaad, Vice President of Cisco Middle East and Africa,

emphasized the importance of viewing sustainability as a driver of business value. Companies should consider sustainability efforts as a means to enhance operational efficiency, stand out in the market, foster innovation, and boost revenue growth. Cisco's mission is to communicate how technological solutions can deliver business impact and promote sustainability outcomes (Hameed, 2023).

In this work, six research questions were formulated, and below, the answers to these questions and the main findings will be presented.

Answering the first research question "how has Cisco implemented circular economy principles in its business operations and strategies?", Cisco's actions towards circular economy can be categorized into five main categories:

1. Circular design: the creation of products and packaging considers circular principles, including designs for reusability, repairability, recyclability, and resource efficiency.
2. Circular operations: Cisco aims to decrease resource consumption and promote the use of renewable sources throughout its value chain.
3. Circular consumption: the company manages its equipment to extend their lifespan through multiple cycles and explores new business models that support this approach.
4. Circular solutions: Cisco is at the forefront of developing technology solutions and services that empower circular economy practices and value creation for its customers.
5. Circular leadership: Cisco plays a leading role in promoting circular economy principles through industry innovation, collaboration, and engagement in shaping public policies.

Answering the second research question: "what were the driving factors that led Cisco to transition to a circular economy model for business development?", Cisco's transition to a circular economy model for business development was driven by a combination of sustainability goals, market demand, resource efficiency, regulatory compliance, innovation opportunities, stakeholder expectations, cost reduction, and risk mitigation. These factors collectively motivated Cisco to embrace circular economy principles as a strategic approach to business development.

Answering the third research question: “what challenges did Cisco face during the transition to a circular economy, and how were these challenges addressed?”, there are challenges in such fields as management, coordination and collaboration, product redesign, supply chain management, regulatory compliance, consumer behavior, technological innovation, ecosystem engagement, data collection and analysis. Transitioning to a circular economy requires a significant shift in organizational mindset and practices. Cisco addressed this challenge by creating the Circular Economy Executive Change Network, a group of senior thought leaders who supported the circular economy objectives and encouraged engagement throughout the organization. This network helped drive the cultural change necessary for the transition.

Implementing circular economy principles across various departments, including operations, sales, marketing, and sustainability, requires close coordination and collaboration. Cisco established cross-functional teams to ensure that different departments worked together effectively to achieve circular economy goals. Designing products for circularity, such as reusability and recyclability, can be complex. Cisco addressed this challenge by investing in research and development to redesign its products and packaging with circularity in mind. This included considering factors like repairability and resource efficiency.

Managing a circular supply chain involves sourcing materials sustainably, optimizing logistics, and handling reverse logistics for product returns and recycling. Cisco worked on strengthening its supply chain practices to align with circular economy principles. Adhering to environmental regulations and standards while transitioning to a circular economy can be challenging. Cisco closely monitored evolving regulations and ensured its practices remained compliant. Encouraging customers to adopt circular consumption models can be a challenge. Cisco deployed new business models and strategies to facilitate circular consumption, such as equipment management for multiple lifecycles.

Developing technology solutions and services that enable circular economy practices required innovation. Cisco invested in research and development to pioneer technology solutions aligned with circular economy principles. Advancing a circular economy through industry innovation, collaboration, and public policy engagement can be challenging due to the need for cooperation with various stakeholders. Cisco actively engaged in industry collaborations and partnerships to promote circular economy initiatives. Gathering and

analyzing data related to circular economy practices is essential for monitoring progress and making informed decisions. Cisco implemented robust data collection and analysis methods to track its circular economy performance.

Answering the fourth research question: “what specific benefits and outcomes has Cisco realized as a result of adopting circular economy principles for business development?”, there are some benefits and outcomes both for the company and the environment. Cisco’s efforts in waste reduction have been substantial. In fiscal year 2022, the company diverted approximately 75% of the waste generated at its facilities from landfill globally. This represents a significant reduction in the environmental impact associated with waste disposal. By implementing projects focused on energy efficiency, Cisco has managed to avoid approximately 14,5 GWh of energy consumption annually. This not only reduces its energy bills but also decreases its carbon footprint by avoiding the release of greenhouse gases into the atmosphere.

Transitioning to circular practices and optimizing operations has contributed to a reduction in carbon emissions. For example, Cisco's initiatives resulted in reducing Scope 1 natural gas usage from 90 GWh in 2018 to 46 GWh in 2022. Circular economy principles have allowed Cisco to conserve valuable resources. By incorporating circular design into product development, the company has reduced the demand for raw materials. For instance, Cisco’s focus on designing products for resource efficiency contributed to fewer materials used in product manufacturing. Circular economy practices have improved operational efficiency. Cisco’s initiatives in this regard include reducing the consumption of resources like natural gas and transportation fuel. For example, the company reduced its transportation fuel usage from 65 GWh in 2018 to 75 GWh in 2022, reflecting a more efficient transportation operation.

Cisco’s commitment to sustainability through circular economy principles has enhanced its brand reputation. The company’s adoption of circular practices and its efforts in reducing environmental impact have positioned it as an environmentally responsible organization. This has likely led to increased stakeholder trust and brand loyalty. In addition, the adoption of circular economy practices often leads to cost savings in the long run. Reduced waste disposal costs, lower energy bills, and more efficient resource use contribute to financial benefits for the company. Moreover, Cisco’s circular economy initiatives, such as offering circular

solutions and services, may attract environmentally conscious customers. These customers may choose Cisco's products and services over competitors, leading to increased market share and revenue.

Answering the fifth research question "how does Cisco's case contribute to the understanding of the broader implications of circular economy adoption for other businesses?". Cisco's example demonstrates that circular economy adoption can lead to waste reduction, energy efficiency, carbon emission reduction, resource conservation, operational efficiency, improved brand reputation, potential cost savings, and increased customer attraction. This also demonstrates how circular economy strategies and initiatives can enhance one's brand, advance science, develop one's business, and cultivate an entire generation of individuals with the same values and enthusiasm. The world, in the form of ratings, awards, and company service purchases, shows how relevant and in demand these actions are, indicating that industries need such examples to change the world for the better.

Answering the last, six, research question: "what lessons can be learned from Cisco's experience that can guide other companies interested in transitioning to a circular economy model?", Cisco's experience offers several valuable lessons for companies interested in transitioning to a circular economy model such as:

- for a successful transition to a circular economy, the support of the company's top leadership is crucial. It is this leadership that must endorse and recognize the necessity for such changes. Furthermore, this commitment should be shared and upheld by other individuals in leadership positions, as they will be instrumental in implementing and monitoring the changes;
- next lesson is to invest in innovation, especially those that focus on creating sustainable products and services;
- to understand which areas require change and new solutions, it is necessary to use data analytics to track progress and make informed decisions;
- it is crucial to optimize resource consumption to reduce environmental impact;
- transitioning to electric vehicles is a practical step toward sustainability;
- to collaborate with stakeholders, industry peers, policymakers to advance circular economy goals and drive industry-wide change;

- sharing progress and achievements through reports and certifications enhances credibility is important step which maintains transparency in sustainability reporting.

Such conclusions were reached after a thorough analysis of the company that implemented circular economy principles for business development. Based on the answers to the research questions, all three hypotheses set forth in this study were confirmed:

H1: The transition to a circular economy positively impacts business development, leading to increased operational efficiency, reduced waste generation, and enhanced resource management for companies like Cisco.

H2: Cisco's adoption of circular economy principles has resulted in improved brand reputation, stakeholder engagement, and market positioning due to its commitment to sustainable business practices and innovative approaches to product lifecycle management.

H3: The case study of Cisco's transition to a circular economy provides valuable insights into the challenges and opportunities that companies face when implementing circular economy strategies, highlighting the role of cross-functional collaboration, technological innovation, and stakeholder alignment in successful adoption.

Conclusions

In conclusion, this research has provided a comprehensive analysis of Cisco's transition to a circular economy model for business development. It is evident that Cisco's commitment to circular economy principles has yielded significant benefits and outcomes, both for the company and the environment. The key drivers behind this transition included sustainability goals, market demand, resource efficiency, regulatory compliance, innovation opportunities, stakeholder expectations, cost reduction, and risk mitigation.

Cisco's experience offers valuable lessons for other companies interested in embracing circular economy principles. Firstly, the support of top leadership is essential for a successful transition, and this commitment should be echoed throughout the organization. Secondly, investing in innovation, especially in sustainable products and services, is crucial. Thirdly, data analytics should be employed to track progress and inform decision-making. Fourthly, optimizing resource consumption and transitioning to electric vehicles are practical steps towards sustainability. Fifthly, collaboration with stakeholders, industry peers, and policymakers is vital for driving industry-wide change. Lastly, sharing progress and achievements through reports and certifications enhances credibility and transparency in sustainability reporting.

The research findings have confirmed the hypotheses that transitioning to a circular economy positively impacts business development, enhances brand reputation, and provides valuable insights into the challenges and opportunities of circular economy adoption. Cisco's example demonstrates the broader implications of circular economy adoption, including waste reduction, energy efficiency, carbon emission reduction, resource conservation, operational efficiency, improved brand reputation, cost savings, and increased customer attraction. In a world increasingly focused on sustainability, Cisco's journey serves as a beacon of hope and a practical guide for businesses aiming to transition to a circular economy model. By embracing circular economy principles, companies can not only drive positive environmental change but also strengthen their competitiveness, foster innovation, and contribute to a more sustainable and prosperous future.

In addition, the transition to a circular economy model benefits the business and it also positively affect their development. Today the environmental consciousness of company is

increasingly valued by consumers, investors, and partners, this enhanced reputation. Moreover, by minimizing resource consumption and diverting waste from landfills, companies can achieve significant cost savings over time. These savings contribute directly to improved operational efficiency and profitability, bolstering the financial health of the organization. By redesigning products with reusability and resource efficiency in mind, the company not only minimizes its ecological footprint but also introduces new, sustainable solutions to the market. Furthermore, the circular economy catalyzes growth by opening up new markets and promoting industry-wide change. Ultimately, this inclusive approach aligns business development with societal well-being. As Cisco's experience illustrates, the transition to a circular economy is not just a corporate responsibility, it is a strategic choice with far-reaching implications for business success in the 21st century.

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