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Sustainable Web Use and Services

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Abstract

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Abstract

Digital transformation is factually a potential element benefitting sustainable development, but it cannot be denied that it has its environmental impact. The energy consumption in data centres is singly more than in the United Kingdom. Moreover, the worldwide aviation sector is now outdone in terms of carbon emissions by the internet as a whole. The research methodology began with detailed literature covering sustainable business and digital transformation, sustainable web services, and implementation of green practices. This study has selected qualitative research with a deep analysis of several papers, ideally from 2001 to 2023, rather than a numerical approach. Website design contributes to global emissions in two ways when people search for them: They generate electricity and release harmful gases into the atmosphere as a result of their activity. This paper examines the concept related to sustainable web services, including an approach to digital tools and products designed to place the planet and people up front. In addition, a study found that energy-efficient products and services are faster and hence ensure improved user experience, conveniently accessible on weak connections, and affordable enough to consume by every member of society, even to the lowest-income individuals.

Keywords

Sustainable Web, Sustainable Web Development, Sustainable Web Standards, Carbon-neutral Web Services

Contents

List of Abbreviation

ICT - Information & Communication Technology

IoT - Internet of Things

MDGs - Millennium Development Goals

SDGs - Sustainable Development Goals

OWG - Open Working Group

CDR - Corporate Digital Responsibility

EDI - Electronic Data Exchange

CO2 - Carbon Dioxide

UN - United Nations

PPP - Public-Private Partnership

Green IT - Green Information Technology

DTT - Digital Transformation Technology

RBV - Resource-Based View

IT - Information Technology

CSR - Corporate Social Responsibility

TAM - Technology Acceptance Model

API - Application Programming Interface

IoT - Internet of Things

SaaS - Software as a Service

PaaS - Platform as a Service

IaaS - Infrastructure as a Service

IT - Information Technology

HTTP - Hypertext Transfer Protocol

HTML - Hypertext Markup Language

CSS - Cascading Style Sheets

XML - Extensible Markup Language

JSON - JavaScript Object Notation

SQL - Structured Query Language

R&D - Research & Development

CSR - Corporate Social Responsibility

SDG - Sustainable Development Goals

GHG - Greenhouse Gas

KPI - Key Performance Indicator

SWOT - Strengths, Weaknesses, Opportunities, & Threats

PESTEL - Political, Economic, Social, Technological, Environmental, & Legal

ROI - Return on Investment

ESG - Environmental, Social, & Governance

LCA - Life Cycle Assessment

SME - Small & Medium-sized Enterprises

EPR: Expected Productivity Ratios

CUI: Conversational User Interface

CSR: Customer Service Representative

SM: social media

DT: Digital Transformation

SDT: Sustainable Digital Technology

CBR: Consumer Behaviour & Reviews

ISMS: Information Security Management System

CWS: Company Web Services

BWS: Business Web Services

OWS: Outsourcing Web Services

1 Introduction

Digital transformation of businesses, like other services, ensures sustainable growth and time-saving management. The focus of businesses is shifting away from conventional functions such as marketing, sales, and customer service, and instead emphasising customer engagement. Evidently, it is replacing conventional practices with technical and machine-based proficiency (Brengel 2019, p.80.). An alluring transition has been observed with the shifting of paperwork into Excel sheets and excels sheets into intelligent applications. The integration of technologies and machines has become prominent in every business's actions or daily home chores making several operations convenient and rapid enough to enhance productivity (Agarwal et al. 2022, p.333.). (Singh et al. 2022, p. 120.) assert that the Internet of Things (IoT) plays a crucial role in facilitating communication between electronic devices and sensors through the internet, thereby serving as the primary catalyst for digitisation.

E-commerce refers to the commercial transactions of products and services conducted through the internet. Mobile commerce, Internet marketing, online transaction processing, electronic data exchange (EDI), electronic funds transfers, inventory management systems, supply chain management, and automated data gathering systems are a small selection of the technologies employed in electronic trade (Belli et al. 2019, p.17.). Although it may also include a wider variety of technologies, including e-mail, mobile devices, social media, and telephones, modern electronic commerce often uses the World Wide Web at least once during the transaction's life cycle (Mishra & Tyagi 2019, p. 123.). While on the other hand, the website plays a chief role in the business transactions such as buying and selling products and services on the internet. All of these advancements have been observed with immense growth in communication and networking facilities. According to (Parida et al 2019, p.291.) the Internet Society is of the opinion that the internet provides a unique platform for promoting creativity, economic prospects, and social integration, and can play a crucial role in achieving various objectives. However, it is important to note that digital technologies have a notable impact on the environment due to their high energy consumption and the carbon footprints generated by network organisations (Sharma & Dash 2022, p.78.).

The United Nations approved the eight Millennium Development Goals (MDGs) in 2000, which set goals for reducing poverty and ensuring access to necessities, including food, water, health care, and education (Fuller & Dwivedi, 2019). Also, they commended public-private partnerships to "make the benefits of emerging technology accessible, particularly ICTs." A United Nations international Open Working Group (OWG) has created seventeen suggested Sustainable Development Goals (SDGs) and 169 objectives (Baumgartner 2019, p.130.). The advancement of the digital economy has been facilitated by the utilisation, creation, and transmission of internet platforms, which rely on broadband services and networks. According to (Zhang 2023, p.75.) the realisation of macroeconomic objectives may be impeded if the full potential of Internet capabilities remains unrealized. Sustainability is a topic of extensive discussion within the web development industry.

Numerous nations worldwide are prioritising the establishment of a sustainable environment, with a focus on reducing carbon footprint, waste material, and preserving natural resources, as a means of mitigating global warming and climate change Airehrour et al. 2019, p.120.). These may involve programs like virtualizing servers, sourcing renewable energy, using energy-efficient technology and optimizing data centers. Digital transformation is precisely a potential element benefitting sustainable development, but it cannot be denied that it has its environmental impact. According to (Koronen et al. 2020, p.176.) the energy consumption in data centres surpasses that of the United Kingdom. Moreover, the worldwide aviation sector is now outdone in terms of carbon emissions by the internet as a whole. Although the amount of energy consumed by each individual transaction with a digital service is small in and of itself, they quickly add up. For instance, developer Danny Van Kooten cut 20 kilobits of JavaScript from the widely used MailChimp for WordPress plugin, which is used by over two million websites (Iqbal et al. 2020, p.156.). He estimated that this alone would prevent 700 tonnes of CO2 emissions annually. It demonstrates how tiny efficiency gains may have a significant impact when expanded.

The concept of sustainable web services includes an approach to digital tools and product designing with placing the planet and people up front (Ghoreishi & Happonen, 2020). Given that sustainable digital initiatives should not view digital technology as a source of problems, but rather as a means of providing solutions. (Wu et al, 2019) assert that energy-efficient products and services offer enhanced user experience due to their faster speed, convenient accessibility on weak connections, and affordability, which makes them accessible to even the lowest income individuals. A larger Corporate Digital Responsibility (CDR) strategy, which incorporates social, economic, environmental, and technical initiatives, also includes sustainable web design (Weber-Lewerenz, 2021, p.25.). The principles of sustainable web design may be used to optimise and boost the performance of any app, website, or online media. This study emphasises sustainable web services development and its exploitation in the businesses as a whole transformation maximising the benefits in the management.

1.1 Introduction to Sustainability

Sustainability refers to the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs. It is a broad concept that encompasses various aspects, including environmental, economic, and social dimensions. The main goal of sustainability is to maintain a balance between these dimensions, ensuring that our actions today do not lead to negative consequences for future generations.

Environmental sustainability involves the protection and conservation of natural resources, reducing waste, pollution, and emissions, and promoting biodiversity. It seeks to minimize human impact on ecosystems and promote the responsible use of resources (Camilleri, 2020, p.184). Economic sustainability focuses on the long-term economic growth and stability of communities and regions, while ensuring that economic development is inclusive and equitable. It involves creating stable jobs, investing in education and infrastructure, and promoting innovation and entrepreneurship. Social sustainability is concerned with the well-being, health, and quality of life of individuals and communities (Kyngäs 2020, p. 70.) It encompasses aspects such as social equity, human rights, access to essential services, and the creation of inclusive, safe, and resilient communities.

The authors of Sustainable Web Usage and Services consider not only economic and social sustainability, but also environmental sustainability (Weber-Lewerenz, 2021, p.25.). Its goal is to lessen the ecological footprint of digital services and goods without sacrificing functionality. Sustainable web design is guided by a set of principles that aim to reduce the website's impact on the environment while also improving its usability for as many people as possible. Sustainable Web Usage and Services considers environmental sustainability with social sustainability and economic sustainability. Making sure that all people, regardless of where they live or how much money they have, have access to the same quality of services and goods offered on the internet is an important part of this. The end objective is to build a digital environment that can last for decades to come and is fair for all participants.

1.2 Background

An approach to implement technological innovations to save time and reduce efforts to benefit the environment is termed sustainability. In the competitive market, the sustainable structure of businesses has been promoted by innovation in the ongoing operations. The term "sustainable online services" Defines green practises" in software development and maintenance for online applications and services. (Papetti et al., 2019, p. 217.). Reduced carbon footprint, higher resource efficiency, and increased corporate social responsibility are just a few advantages of using sustainable online services in the company (Broday et al 2022, p.167.).

The concept was first developed to lessen the adverse effects of business activities on the environment without sacrificing financial success. In this scenario, businesses had to put in a lot of effort to become self-sufficient, as doing so necessitated significant capital investments and the incorporation of new technologies. Some of the most tech-oriented companies, like Amazon. Inc is confined to a carbon neutral point; however, the company possessed a core carbon-offsetting plan that included the Sustainable Web Services Module, investment in the renewable energy sector and contribution to the forestation projects and this plan of Amazon.Inc consequently supported the idea of carbon reduction without any significant modification in the business model (Campbell, 2020, p.190.). Additionally, the “Google Search Engine Web Page” is also referred to as one of the most successful and critical examples of a sustainable website or web solution because, ironically, this prospect possessed a significantly higher online presence with complete access to high-quality services accompanied with the minimized level of the carbon footprints (Brickley et al. 2019, p.134.). Conclusively all of the sustainable web services solutions constituted within the technology development. The role of technology development within sustainable development is crucial, as integrating the new product or services in the market with fine-tuning of the offering is the foundation of sustainable development acquired by the technology development. The integration of sustainable web services created the chance for the company to achieve high customer satisfaction long term market benefits with the element of sustainability.

For sustainable web services, the "Green IT" term has been used. The apparent goals are imparting reducing the adverse effects of energy and waste on the environment (Naim et al. 2022, p.195.). There are other goals as well including, boosted performance and customer engagements with cost-effective methods. Systematic thinking, corporate culture, and sustainable business are the three main components of sustainable innovations. Businesses that use sustainable innovation are long-term-oriented and strive to meet customer needs for morally and environmentally responsible behaviour (Lynch 2020, p.103.). They understand that customers judge businesses on their ethical and sustainable business practices and that these assessments affect their decisions to reinforce business operations.

1.3 Research Aims

The following thesis research seeks to accomplish several objectives concerning sustainable and innovative web services implementation in business management.

- To understand sustainable web designing with innovative strategies to reduce the adverse environmental impact.
- To investigate the current procedures in the businesses for digital transformation.
- To discover the role of sustainable advancements and their impacts on consumer behaviour.
- To explore the effective implementation of web services for business sustainability in the competitive market.
- To assess how policy and regulatory frameworks affect the creation and uptake of sustainable online services and to find strategies for fostering a supportive policy climate.
- To find the success of several sustainability and certifications for online services, as well as suggestions for how to enhance and standardise existing systems.

1.4 Research Question

1. How successfully are sustainable web services being operated by network providers?
2. What role has digitization in business has playing in customer engagements and increased productivity?
3. What obstacles could companies encounter while deploying sustainable online services, and how might these obstacles be overcome?

2 Literature Review

2.1 Organizational Performance and Technology Innovations

Organisational performance has become extensively improved over the past few decades due to the intervention of advanced technologies. In contrast, more expectations have been raised in making sustainable management (Kraus et al. 2022, p. 123.). Today's firms are fortunate to enjoy the panorama of future-required technologies, Previously, only a few businesses had access to cutting-edge tools (Vaska aet al. 2021, p.53.). However, because of the effects of increased technological development on the environment, sustainability in business operations has risen to the top of organizations' lists of objectives for adopting green practises. Several academics have concluded, organizations are able to accomplish a top level of sustainability in the market by complementing social, economic, and environmental expectations (Lariviere & Smit, 2022; Fischer et al. 2020 & Sheth & Parvatiyar, 2021, p.78.). There are numerous advantages to employing green practices. Among them, the most important is the conservation of resources to secure the future of the upcoming generation. However, inquiries regarding how the industry performs in terms of the environment have gained prominence across various industries.

According to (Anthony 2019, p.97.), an organization's progress in environmental performance may be seen in the number of natural resources used, the amount of waste created, the percentage of waste that is processed, and the effects of operations on the environment. However, a number of studies have been conducted to investigate the role of information technologies in minimizing the hazardous effects on the environment (Anthony et al., 2019; Khan et al., 2021; & Chien et al. 2021, p.110.). According to (El-Haddadeh 2020, p.197.), from the standpoint of the organization, organizations are under pressure to expand the adoption of new apps or services in order to maintain their competitive edge. Sustainability concerns are also a crucial component of this transformation's strategic planning for businesses. (Liu et al. 2021, p.128.) stated that the supply chain promotes connection, decentralization, and transparency. Also, it enables real-time tracking and has a favourable effect on industrial sustainability. Similar to this (Junge 2019, P. 13.), performed a literature study to pinpoint every Digital Transformation Technology (DTT) used in the industrial sector. It has been shown that DTT technologies like auto-identification and cloud computing enhance the effectiveness, visibility, and optimization of logistical resources and supply chain management procedures.

Even though financial constraints must be removed, managerial opposition to change must be vanquished in order to implement digital transformation successfully. Moreover, it solicits workers' and end users' participation as smart factories or computer-supported human workstations call for a shift in work activities and customer preferences. To process the digital transformation, an involved web has been designed to carry out the processes online in an authentic platform. The web allows for rapid access to information and intelligence while impacting the speed and frequency of information transmission, providing managers with numerous chances to connect with stakeholders and immediately communicate with them. However, the role of social media in business operations is an excellent platform to engage with customers, maintain relationships with other organizations, and obtain public data. Whether business strategies in managing and performing its daily task is traditional or digital, nature has been affected, and still, the process is in running.

Organizational performance and sustainability are intertwined, with the latter being rewarded by the former in the form of cost savings, enhanced reputation, and increased stakeholder involvement. Sustainable online use and services, according to researchers, may have a beneficial effect on both a company's environmental footprint and its bottom line (Alraja & Hamdoun, 2022, p.167.).

Greener browsing and services help meet the rising need for low-energy, easy-to-use, and universally accessible digital goods as new technologies emerge. Faster page loads, less data use, and less energy consumption are just a few of the potential benefits of embracing sustainable web design principles, as stated by researchers.

The competitiveness of an organization is only one metric that may be affected by the use of eco-friendly digital technology. According to researchers, businesses that prioritize sustainability may distinguish themselves in the marketplace and win over environmentally sensitive consumers.

Finally, the obstacles that businesses may have while trying to establish sustainable online use and services must be taken into account. While the advantages are clear, some businesses may meet obstacles including internal pushback to change, insufficient knowledge, or inadequate resources. Successful adoption of sustainable web technologies may lead to increased productivity in the workplace if these obstacles are overcome and a sustainability culture is fostered from the top down.

2.1.1 Theories for Organizational Performance and Technology Innovations

2.1.1.1 Resource-Based View (RBV) Theory

This theoretical framework asserts, businesses may get an edge in the marketplace by making the most of their special strengths (Anthony et al., 2019; Khan et al., 2021; & Chien et al., 2021, p.120.). Companies can set themselves apart from the competition and boost their overall performance by investing in green technologies, energy-efficient servers, and eco-friendly practices related to sustainable web usage and services.

The resource-based view (RBV) hypothesis provides a useful lens through which to investigate the link between technological innovation and the success of businesses. According to researchers, organizations may gain an edge in the market by making the most of their special skills and resources, such as the ability to embrace sustainable online technologies (Jacobson et al., 2020, p.146.).

2.1.1.2 Dynamic Capabilities Theory

Adaptability to new technology and shifting market circumstances are at the heart of this philosophy. Companies may find and embrace sustainable technologies and practices for online services, such renewable energy sources, virtualization, and energy-efficient hardware, by establishing dynamic capabilities (Kraus et al 2022, p.134.).

2.1.1.3 Innovation Diffusion Theory

This theory describes how new ideas and products circulate within a given market or organization (Alraja & Hamdoun, 2022). Finding and focusing on the industry's early adopters and influencers may greatly increase the rate at which eco-friendly technology and practices are adopted, which in turn will increase the prevalence of more sustainable online use and services.

2.2 Digitalized Communication and Consumer Effects

From the modern perspective, the importance of Social Media as a marketing tool is ultimate and the involvement of social media is also significant in the context of developing and implementing marketing strategies, and this phenomenon is a vital form of Modern Web Services. The studies developed the fact that 80% of the consumers from different sectors established that social media marketing impacted the buying decisions in the market and light of this influence marketers across the globe developed and applied better forms of social media marketing. Social media marketing is also referred to as E-marketing or digital marketing because it involved the utilization of internet-based digital platforms, especially social media platforms (Li et al., 2021). The primary purpose behind social media marketing was the development of social networks and the sharing of company-related information with the mass audience to achieve the objectives of image development, and increment in the sales revenue followed by reaching a larger audience in a quick time (Jacobson et al., 2020). Cheung et al (2020), highlighted that social media marketing served as a potent tool for engagement with the new and potential consumers of the company and it is also associated with the big data analytics that empowered the marketers in the company to track the success of the implied strategies and facilitated the development enhanced and effective engaging policies. The social media marketing under the digital transformation of the business enlighten to possess some core associations with the Sustainable business dimensions. The findings of the study by (Gupta et al 2021, p.145.) enlighten some of the key positives that showcased the positives involved in CSR communication over the channel of Social Media, which fulfilled the objectives in the dimensions of acting as a marketing strategy. CSR communication on social media facilitated the connection between the social segments of the community and allowed the exposure of CSR activities and messages to a large audience with a single click which appeared impossible in the previous time. Additionally, CSR communication over social media provided multiple avenues for connection like content channels on YouTube, Social platforms like Facebook and interactive blogging like Twitter; hence it achieved the element of enhanced connection just like the marketing on the channels of Social Media.

Moreover, the interaction that appeared as one of the problems in CSR communication was sorted out by Social Media based CSR communication. The fact is elaborated that social media platforms allowed dynamic interactions and involved direct interactions like commenting along with passive interactions through sharing and liking. This interaction and sharing of the culture of the CSR messages are covered in the contagion effect of electronic word-of-mouth marketing which is referred to as one of the key drivers of influencing the consumer decision. Thus, the involvement of interaction on social media also empowered the strategy of CSR communication over social media as one of the marketing strategies for the business organization)Galati et al. 2019, p.128.). In alignment with these findings, Okazaki et al (2020), indicated another important element of CSR communication via the channel of social media, the marketing plan of social media possessed the potential of boosting the marketing objectives. The combinations of social media marketing tools and CSR communication over social media extracted the consumer data and lead it towards actionable market analysis and insights. Hence CSR communication over social media fulfilled some major dimensions that allowed its categorization as one of the marketing tactics for business organizations.

Through the proliferation of digital communication channels, businesses are now able to communicate with their customers in near-real time. Businesses that place a premium on sustainability in their digital communication strategies will build good associations and customer trust in the context of eco-friendly online use and services. This is becoming more crucial as consumer awareness of environmental and social problems increases.

Researchers have studied how sustainability affects consumer decisions and behaviour, and they've found that digitalized communication has a major influence in determining these results (Sharma & Dash, 2022, p.129.). According to research conducted by Researchers, companies may boost their loyalty and purchase intent by successfully communicating their sustainable practices via digital media (Zhang & Wang, 2023, p.75.).

Furthermore, user experiences may be influenced by sustainable online use and services. Sustainable design concepts, such as energy efficiency and accessibility, may help websites and digital platforms reach more people and provide a more satisfying experience for its users. Customers are more inclined to support businesses that are committed to ethical and environmentally sound online operations.

Sustainable web use and services may help create a more welcoming online space for all users, in addition to influencing consumer behaviour. Sustainable web design has been proved in studies to increase accessibility of digital platforms for those with impairments or constrained network connections. Increasing digital accessibility helps businesses connect with more people and promotes social justice.

2.2.1 Theories of Digitalized Communication and Consumer Effects

2.2.1.1 Uses and Gratifications Theory

According to Gratifications theory, people rely on various forms of online communication to meet their various requirements and desires (Sharma & Dash, 2022, p.129.). Companies may use digital channels to inform and inspire customers to engage in environmentally responsible actions, such as limiting their use of disposable electronic gadgets and switching to those that use less power.

2.2.1.2 Media Richness Theory

According to this theory, the quality of the medium makes a difference in how well information is conveyed (Galati et al., 2019, p.120.). Organizations may choose and develop digital communication channels that deliver the required information while minimizing environmental effect, such as optimizing content for quicker load times or employing low-bandwidth communication techniques, in the context of sustainable online use and services. Technology Acceptance Model (TAM)

2.2.1.3 Technology Acceptance Model (TAM)

The Technology Adoption Model (TAM) describes how factors like perceived utility and usability impact the spread of new technology (Zhang & Wang, 2023, p.75.). The environmental effect of digital communication may be reduced if businesses offer eco-friendly online services and consumer apps that users like using.Social Influence Theory

2.2.1.4 Social Influence Theory

This idea highlights the significance of social context in influencing behaviour (Jacobson et al., 2020). By collaborating with influential people who support and promote eco-friendly online use and services, businesses may convince customers to change their habits in a way that is good for the planet.

2.2.1.5 Consumer Value Theory

The assumptions, norms, and worldviews of consumers are the emphasis of this theory. Organizations may build marketing campaigns and communication strategies that emphasize the environmental advantages of sustainable online use and services by better understanding and appealing to the values of environmentally concerned customers (Jacobson et al. 2020, p.129.).

2.3 Element of Excessive Engagement and Satisfaction

Consumer satisfaction or customer satisfaction is a significant prospect of modern business dynamics, especially in highly competitive business environments. Customer satisfaction is highlighted by that it is the critical measurement that analyzes the level of customer happiness and comfort with the products, services and operations carried out by them. The element of consumer satisfaction is measured by analysis via surveys and ratings, which is ultimate for developing product. Consumer satisfaction is important because it highlights the level of satisfaction possessed by the client base of the particular organization. On the other, the lower consumer satisfaction declined the overall sales graph and return consumers ended in revenue decline. This proved that the revenue cycle of the is directly associated with consumer satisfaction.

Additionally, (Kurtkoti 2016, p.28.) Highlighted that petroleum and electricity are the basic needs in the globalized business world after food and clothing, which require sustainability and coverage continuity in the supply chain for continued and effective distribution; in this same direction, some major oil and Gas along with Electricity companies like PetroChina Co. Ltd, Saudi Aramco and Tata Power India incorporated various implication strategies like CSR to enhance the consumer satisfaction because in this particular sector, the purchase is directly subjected to satisfaction and trust. The responses on the Social-Media over the CSR communication by ADNOC and Equinor ASA, made it profound that these communicational messages critically affect the satisfaction content of the consumers, and there is a stress over consumer satisfaction displayed in the responses of the consumers. Good CSR Practice is directly related to the enhancement in customer satisfaction, as (Islam et al 2023, p.124.) illustrated in the study that good and transparent CSR improves consumer satisfaction via the channel of direct evaluation by the consumers and the purchase of products or services from the responsible firm developed the sustainable satisfaction among the consumer base, on this ground, it was theoretically evident that CSR practices possessed direct and positive relationship with the consumer satisfaction, especially in the energy sector, and as marketing tactics like advertising also aimed to satisfy consumers, it became clear that CSR communication served as a marketing strategy. After all, consumer satisfaction is associated with loyalty and influences the word-of-mouth marketing (Myo et al. 2019, p.120.) hence the consumers also reacted like this to the CSR communication which firmed its reputation as a marketing strategy.

2.4 Drawbacks of Web Solutions and Services

Despite the fact that businesses drifted towards digitalization to attain sustainability, however, digitalization procedures also involved releasing carbon footprints excessively high energy levels by giving up (Sharma & Dash, 2022, p.187.). The current issue is to implement sustainability in digital operations by reserving energies and reducing carbon emissions. According to studies, the buildings that house the routers, switches, servers, and other technology used to store and provide online applications and data to end users, or data centres, are the single biggest source of carbon emissions when attempting to quantify the carbon footprint of the internet (Zhang &

Wang, 2023,.p.75.). Around 2 trillion gigabytes of storage space are presently available in data centres globally (Al Kez et al., 2022, p.57).

Moreover, internet traffic between data centres and other locations is increasing by an incredible 25% annually (Hussein et al., 2023, p.87.). Making the switch to renewable energy sources is, therefore, necessary to minimize the environmental impact of data centres. In this way, data centres use non-renewable energy sources. Yet, if data centres are powered entirely by sustainable power, their investments might hasten the transition to a world economy driven by renewable resources. Several significant operators of data centres are committed to Resignation 100% renewable energy and remained successful in achieving sustainability goals (Strielkowski et al., 2021, p.195.). contributed in the study of sustainable web designing by explaining that the idea behind sustainable web design is that effective design can minimize the amount of data that needs to be transmitted between a user and a web host, thereby minimizing carbon emissions throughout the entire system, from the data centre to the office computer or mobile phone.

There are certain potential downsides to sustainable online use and services brought about by the rising trend towards digitalization and web-based solutions. The effect on the natural world is a major worry. A rise in environmentally hazardous electronic trash has been linked to the widespread use of digital technology and gadgets. Energy and materials used in their production are substantial contributors to environmental damage.

The adoption of digital technology may also increase the amount of energy required to run them. The energy needed to run web-based services rise as their user base grows. Carbon emissions and other environmental harm might rise as a result.

There are also worries regarding security and privacy issues related to web-based services and solutions. Large volumes of data, collected and stored in preparation for use of digital technology, may be susceptible to cyber-attacks and other security risks (Chen et al., 2021).

In addition, there may be unintended consequences for long-term social and economic viability if people rely too much on web-based solutions. There is a risk of social and economic isolation as more people depend on these services, since they may reduce in-person connections and local businesses.

2.5 Theories for Drawbacks of Web Solutions and Services

2.5.1.1 Digital Divide Theory

This idea emphasizes how various socioeconomic classes have varying degrees of access to and use of digital technology. If sustainable online solutions are not created with all users in mind, the digital gap may become wider, diminishing the effectiveness of these services as a whole in mitigating environmental damage (Strielkowski et al., 2021, p.195.).

2.5.1.2 Information Overload Theory

The exponential expansion of digital information, according to this hypothesis, might cause users to experience cognitive overload, making it hard to efficiently comprehend and manage the available data (Zhang & Wang, 2023, p.75.). If sustainable online services create too much data or demand too much time or effort from their users, they might be adding to the problem.

2.5.1.3 Technological Determinism Theory

According to this study, developments in technology are the primary factor in shaping new social and cultural norms (Sharma & Dash, 2022, p.120.). It may, however, mislead people into thinking that technological advancements alone would ensure the long-term viability of the web and its associated services, therefore ignoring the critical role that individual actions, societal norms, and corporate policies play in mitigating environmental damage.

2.6 Role of Government- Encouraging Sustainable Online Services

Previous research studies discussed the role and influence of the government towards the sustainability of the business. The study of (Camilleri, 2020) established that in the context of the sustainability transition of the businesses, three stakeholders needed to play a crucial role. Primarily, consumers must shift their spending patterns towards more Eco-friendly products, stressing buying green and sustainable products and services. Secondly, the companies or in the market must acquire the sustainability route and ensure the offering of green products and services in the market. Along with that, the role of government is also very primary, as they were responsible for the development of regulations, policies, tax subsidies modules and trade

Emission rights, conclusively they primarily ensured the development of the business environment focused towards green products and services offerings and this environment created a healthy competition between the businesses facilitating the overall business dynamics transitions. In a similar direction, the research of (Font, 2021) made the fact evident that businesses were the legal entities that developed and operated within the government's jurisdiction. The government impacts the market's economy not only via legal policies that govern the code of conduct for the private market but also through critically imposed policies, judicial decisions, spending and taxes. These prospects of the government influence the market operation dynamics for almost all of the business categories. Some governments across the globe, including the governments of the US, UK and UAE, stressed policy implementation confined to sustainable usage of energy and exploitation of the environment and these policies by the government impacted and forced businesses towards integrating sustainable solutions within the business operations. Hence, the significance of the government's regulation and influence over the sustainable business transition established under these research facts.

Moreover, (Mallett, 2020, p.23.) instructs the best example of government acceleration of business sustainability via technical support. In 2009, the government of the US developed a 787 Billion Dollars Economic plan confined towards accelerating the macro economy, recognized as; the "American Recovery and Reinvestment Act of 2009" (ARRA). The ARRA was unanimously approved by the Federal Cabinet of the US Congress and gained the support of President Obama. This plan included around 80 Billion Dollars for renewable energy, business sustainability and expansion of business manufacturing via clean, bright and more prominent technological solutions and Grids. Besides this, in one research, Khan et al. (2022) analyzed the "Organization for Economic Co-operation and Development (OECD)" countries in the dimension of the government's role towards modern business sustainability. The results of this study unveiled some key practical facts. Primarily, the government is critically responsible for developing appropriately framed markets through which the government ensures the maximization of the potential revenue and image gain for sustainable enterprises using online web services, especially in the post-Covid business market.

It was also highlighted that the tax system is one of the critical constituents of sustainable business and economy. The enhanced utilization of market-based instruments is the critical framework conditional for sustainable development. These instruments played a vital role in developing Web Services and integrating the web services for better environmental policies among the OECD country. Under this prospect, some countries performed significant reforms in the "Green Taxes". In contrast, some countries were reluctant towards it, which caused severe complications for businesses in integrating Web Services and solutions.

Additionally, one of the recent research by (Chen et al. 2021, p.135.) highlighted four fundamental importance of the Government in the direction of digital transformation of businesses. SMEs failed to succeed primarily due to inadequate funding and digital capacity. the digital transformation and acquire the digital platform and web services effectively. Conversely, these SMEs were significantly less profitable, so access to web services from third-party suppliers also appeared non-viable. Under this context, the role of the Government is very prominent because they could actively provide funds for the development of Web services and digital platforms. (Britvin, 2022, p.13.) The utilization of these web services on the internal level digitalized the businesses on the internal level and external levels as well. Besides this, the Government could also actively promote the tools confined to helping the SMEs in the digital transformation, including; "e-commerce, official websites, social media and mobile applications", and collectively digital transformation is significant for the sustainable approach of the business.

Secondly, for the enhanced use of digital transformation and business sustainability, the government must ensure the promotion of mobile payments and digital payments, as the digital payment system possesses a significant role in the digital ecosystem of the business but requires support from the customers and the business entities. Some of the big companies like Alibaba issued the digital payment system Alipay, backed up by the economic power to drive the users towards the platform till the economic scale is achieved, but contrary to this, the SMEs possessed incompetence in this domain. Under this, standard business organizations entirely rely upon the mobile payment module or web services constructed by the government, followed by usage promotion (Chen et al. 2021, p.112.), hence also appearing as an essential role of the government.

Additionally, (Chen et al., 2021, p.110.) further enlighten that government policies and support helped the digital capacities elevation for the SMEs, especially in the domain of education of the business stakeholders like managers, staff and owners. As for the proper implementation of Web services, digital training is a must because it increases the knowledge among the business stakeholders and actively influences the organizational capabilities. Moreover, the government can assist small companies by creating an ecosystem that encourages collaboration and allows them to expand their networks. Systems for collaboration will assist small companies in connecting with other parties and fostering joint creativity. (Kennedy, 2022, p.78.) Collaboration enables tiny service businesses to surmount resource constraints, human resource shortages, and knowledge gaps. Small service businesses can collaborate using the following four models: knowledge sharing, resource sharing, marketing innovation, and product/service innovation models. Even with limited resources, a small company can improve performance and accomplish business development by creating collaboration with partners.

The role of governments in promoting the long-term viability of internet services is crucial. The government may support ecologically friendly practices and hence encourage sustainable internet services by enacting legislation and regulations. Governments may encourage businesses to adopt sustainable practices by offering financial incentives. Businesses that switch to renewable energy sources may qualify for tax benefits from the government. Companies' environmental effect may be reported on by the government if rules are put in place to do so.

Multiple studies have shown that carbon emissions may be drastically reduced in response to government incentives and restrictions (Chen et al., 2021). Additionally, governments may fund Rand to create innovative technologies that support long-term online service provision. The government, for instance, might fund the creation of eco-friendly data centres powered by renewable energy.

2.7 Theories for Role of Government- Encouraging Sustainable Online Services

2.7.1.1 Public Goods Theory

The non-excludable and non-rivalries nature of certain commodities and services means that their benefits accrue to everyone in society, according to this view (Hussein,2020, p.37.). Providing environmentally and socially responsible online infrastructure and services is akin to providing a public benefit. As a means of encouraging the creation and use of environmentally friendly digital services, governments may finance green technology and infrastructure.

2.7.1.2 Regulation Theory

This idea emphasises the role of government in regulating and standardising many industries, including the internet (Strielkowski et al., 2021, p.195.). Energy efficiency requirements for data centers, e-waste recycling programs, and standards for eco-friendly site design are all examples of rules that governments may create and implement to encourage sustainable web use and services.

2.7.1.3 Policy Instruments Theory

This theory analyses the methods through which governments may accomplish their goals. Governments may employ a variety of policy tools, including rules, financial incentives, and awareness campaigns, to promote eco-friendly digital practises among businesses and consumers in the context of sustainable online services (Chen et al., 2021)

3 Methodology

The "methodology" is the term which is used frequently in academic-based research, and it refers to the processes which are employed to gather all the data (Martin, 2020, p.199.). Without the research methodology, tracking and isolating the data for the topic analysis is difficult. In addition, this chapter focuses on all the methodological-based approaches, designs and techniques. The research methodology began with detailed literature covering sustainable business and digital transformation, sustainable web services, and implementation of green practices. This study has selected qualitative research with a deep analysis of several papers, ideally from 2001 to 2023, rather than a numerical approach. The methodical, scientific procedure researchers use to gather, examine, and evaluate data to respond to a research topic is called research methodology (Mengist et al., 2020, p.100.). The choice of research technique is influenced by the nature of the study's goals; the data used, and the research design.

3.1 Research Plan

The first order of business was to define the broad scope of the sustainable design study field. We gathered forty to fifty design researchers and experts for a workshop to discuss and compile a list of community objectives. The group synthesised and elaborated on this collective definition of the sustainable design community's aspirations to create an ideal future that envisions a world where sustainable design is a common practise in the industry. Similarly, we could describe the baseline condition after thoroughly discussing the current state of sustainable design.

3.2 Research Philosophy

This study takes a pragmatic and cross-disciplinary approach to research. It recognises the significance of practical implementations of sustainable web design principles and real-world repercussions. (Khan, 2020, p.43.) Sustainable web services are the foundation of the research concept because of their potential to enhance online productivity, accessibility, and user experience while reducing waste and other adverse environmental effects.

In addition, the importance of social justice and inclusivity in developing and deploying eco-friendly web services is acknowledged as part of the study's philosophy. (Anthony Jnr, 2019.p.119.) It highlights the importance of digital solutions that are both accessible and inexpensive for people of varying socioeconomic statuses.

This methodological research approach also recognises the interdependence of factors, including technological development, organisational success, governmental oversight, and the general welfare of society. (Fayyomi, 2021, p.111.) It recognises the interconnectedness of environmental, social, and economic factors and advocates for a holistic approach to sustainability in digital service delivery.

In conclusion, this study chose a research philosophy that blends pragmatism, emphasising interdisciplinary viewpoints, practical applications, and real-world consequences. (Chien, 2021, p.197.). There is an emphasis on long-term advantages for people and the planet, focusing on sustainability, social justice, inclusivity, and the optimisation of online services.

Positivist thinkers argue that the best way to illustrate and explain the truth within their worldview is through an objective analysis of the universe and unbiased judgements. In contrast to more conventional methods, positivist research strategies place a premium on complex data as proof. According to Rosa (2019, p.120.), positivist methods are grounded in objective data rather than personal judgement. For research efforts that aim for scientifically grounded, fact-based conclusions utilising approved procedures and sources, resulting in quantifiable outcomes, the recommended approach, according to (Kaur, 2020, p.26.).

In contrast to, values divergent viewpoints and protects the confidentiality of those who request it. As (Althanus, 2020, p.176.) pointed out, places a premium on personal judgement over complex scientific data. Assumes that analysts' preconceived notions and personal preferences colour their evaluation of facts. Changing one's mind in light of fresh evidence and experiences is fundamental to the interpretive search for truth. The concepts of are consistent with the study's exploration of sustainable online usage and services, which does not rely on scientific or quantitative measures. The data that has been made public will be used for descriptive analysis (Zeller, 2022, p.163.). All of these factors favour using as a research approach.

3.3 Research Approach

According to (Guo, 2022), researchers must decide between inductive and deductive methods when drawing up study plans. The consistency of the research philosophy is a function of the research method chosen.

3.3.1.1 Inductive and Deductive Approach

As per (Gilgun ,2019, p.130.) deductive approach is the one which involves the theories which are available already to produce hypotheses which can be explored by using a suitable-based research strategy. This production of hypothesis is made feasible by using the deductive-based method; this allows information which can be transferred from a general body related to knowledge to a more specialized kind. (Dobrescu, 2021, p.94.) All these findings can be used by the researchers in order to infer more information which is related to the connections which exist between the variables and the ideas which are under examination. In contrast, inductive reasoning is considered as the one which is predicated on what has been demonstrated from the study or if the hypothesis is correct or not (Barreto, 2019, p.152.). One of the factors related to the inductive-based technique involves adding new information to current hypotheses, which is present, or developing new kinds of hypotheses.

In contrast, deductive-based reasoning is the one which may result in more specific generalizations compared to inductive thinking because of the reasoning nature. Inductive-based research is often carried out when no previous literature exists on a subject (Nettle, 2019, p.201.). As a result, no hypothesis is present to test such circumstances. The reasoning must begin with an active hypothesis to ensure a solid foundation. The researcher conducting the study has no preconceived beliefs related to the topic in the form of a theory or hypothesis; in such cases, employing a deductive-based research technique is difficult.

All research questions can only be answered by conducting a descriptive-based study; this study is not designed to test any existing-based hypotheses. The only way to answer such research questions is to perform the analysis. Therefore, the inductive-based technique is suitable for carrying out this research study to analyse sustainable web usage and services, which is an important research field which must be investigated.

3.4 Research Design

3.4.1.1 Qualitative and Quantitative Research Design

Using descriptive language, phrases, and words is considered essential in conducting qualitative-based research as it allows all the researchers to make links between the facts and observations. It is possible to put assumptions related to natural events' occurrence and also to test and utilize all the statistical methods to confirm or deny the hypotheses of the research. (Kraus, 2020, p.48.) Many researchers employ qualitative research-based methods to uncover how individuals feel related to the topic by interviewing the study participants (Daniel, 2019, p.101.). Both quantitative and qualitative can be obtained. The information related to the amounts is involved in the qualitative-based data. Examples related to qualitative-based data involve photographs, written descriptions, and audio and video recordings. In addition, journals or in-depth interviews are considered the two methods that can be used to collect such data, which can further be analyzed using either grounded-based theory or the analysis of themes.

In contrast, quantitative data is the one which involves all the information related to the things which can easily be measured, for instance, language, perception, and words, as stated by (Gilbert, 2022, p.117.). Qualitative-based research is the own which helps in collecting, analyzing and interpreting all the non-numerical based data, for instance, spoken language. This qualitative type of data can easily be discovered in various places. All the methods of qualitative-based research can easily be utilised in order to gain insight related to the process through which an individual takes and makes sense related to the social world in which they can easily find themselves. Quantitative methods are used by the researchers to gather and examine all the numerical-based data to gain a deeper understanding related to various essential elements, which can improve the ability to make accurate predictions or regulate those factors.

Even if sustainable web usage and services play an important role in modern marketing tactics, the validity related to the information which is being provided on these platforms plays a vital factor which cannot be easily checked now. All the investigations which are being offered here involve an essential-based component: the consideration related to the significance of sustainable web usage and services in the context of marketing strategies. (Chi, 2021, p.104.). As multiple aspects need to be covered, conducting extensive research on this subject is required. Given the breadth and depth related to all the research study questions and objectives, a qualitative research-based strategy is considered the most appropriate way to handle this problem.

3.5 Data Collection

The most critical parts related to the research-based technique are to gather the information which can be used to resolve all the research questions of the study and to realise the stated goals.

3.5.1.1 Primary and Secondary Data

Primary data is defined as information collected directly from a data source, in contrast to information obtained from other sources. All the primary research-based data is gathered for a particular kind of research topic, and it is then made available to us by one (Paprica 2019, p.47.). The protection related to the personal information of the individual is considered a challenge which must be overcome. Primary-based data are the one which is considered to be more authentic, meaningful, and believable in contrast to secondary-based data, as such data is being gathered in order to answer a particular kind of research question. Primary data is considered difficult to get, as a high cost related to implementation is required in this process (Sahal, 2020). All the primary-based statistics are collected with the input, which is gathered from multiple sources, including academic-based institutions that study the private-based sector, individual-based researchers, and entities belonging to government-authorised.

In comparison, secondary-base data is considered the primary data collected previously, and now it is available for use by other kinds of researchers. Secondary data, as compared to primary-based data, are the ones which are obtained from secondary kind of sources (Biswas, 2021, p.461.). In contrast, primary data are considered as the ones which are compiled from secondary-based data. In addition, if any data is obtained from an existing source, it is considered secondary-based data, and it can easily be utilized as primary-based data for the research study. The decision which the researcher makes whether to make the data easily accessible to the public or not results in producing a significant kind of impact on the secondary data availability.

The process involving primary data collection usually requires a significant amount of time and effort in order to complete the task. (Hussein,2020, p.37.), During the research process phase, which is known as data collecting, considered as one of the essential factors which must be taken into account involves the human subjects' protection which is involved. As a direct consequence, a variety of distinct formal permission processes are required. Some examples which are related to secondary data involve authentic news articles, research reports, and survey summaries

(Davahli, 2020, p.73.). In addition, other examples involve past research and research reports. Secondary data is considered the finest alternative for this research study, as it may be collected and analysed over an unlimited time period. Additionally, primary data is the most reliable type of data.

3.6 Ethical Concerns

Ethical-based considerations are the ones which must be considered when doing research in order to test whether all the results can be trusted or not. Ethical considerations must be prioritized when there is a need related to the collection of primary-based data from human subjects (Ngwa 2022, p.175.). There is no need to evaluate the ethical-based consideration when collecting the primary data, as in this research, there is no need for primary data. In contrast, when secondary data is collected, the researcher must ensure that no previous study data must be used in this study. No private and confidential information was used in this study, and only secondary sources were available for the public; as a result, no ethical-based concerns were conducted related to the research study.

4 Discussions

4.1 Innovation in sustainable web designing

The web's impact on the environment has received a lot of attention and is responsible for 3.7% of global emissions (Garel & Petit-Romec 2021, p.86.). As a result, more and more designers are trying to make their websites sustainable to ensure that they help protect the environment. Developers can incorporate sustainable designs at home or at their business through technological innovations such as the Internet of Things (IoT). with a focus on reducing a website's carbon footprint and increasing its energy efficiency, is one of the newest and fastest growing areas of web design. Sustainable web design is the process of creating websites that save energy, money and the environment. In other words, sustainable web design is about creating eco-friendly websites (Ream et al. 2020, p.108.). Individuals spend about 7 hours a day browsing many websites from their PC screens through various gadgets (Dobrescu et al. 2019, p.199.).

Website design contributes to global emissions in two ways when people search for them: They generate electricity and release harmful gases into the atmosphere as a result of their activity (Rogers et al. 2023, p.111.). Anything related to site layout, e.g. size of text styles, images passed across language, including impact on global projection (Majumdar et al. 2020, p.259.). Everything works, and these seemingly insignificant actions add up over time to dramatically increase global carbon emissions. Sustainable web design was introduced for this reason. There are many ways to make a website design sustainable. The first of these novelties is the application of minimalism. By using less code, fewer images, and fewer files, this method creates a website that loads faster and uses fewer resources (Xie et al. 2022, p.96.). Second, since images are the most important element of a website, they can be optimized (Zantalis et al. 2019, p.194.). Keep images compressed, take up less space, load faster, and speed up website building.

A web page needs to get more server data every time it loads. Therefore, reducing these components will help the website load faster (Britvin et al., 2022, p.201.). For example, use the built-in analytics tool that comes with WordPress instead of using an external script like Google Analytics. Also, import only the stylesheets needed to effectively display the content instead of importing the entire library. There are a number of ways these sustainable web strategies can help the environment. The user interface is made simple and easy to use with these features. The user interface of a green website is generally friendly and easy to use (Yadegaridehkordi et al., 2021, p.101.). Users never feel lost or don't know where to go next. Website visitors have no trouble finding what they are looking for thanks to the thoughtful layout of the information and the clean and simple layout of the site. While designing this website, a company should be able to keep in mind the requirements of its customers.

Businesses need to ensure their websites are mobile-friendly as an increasing number of internet users continue to access online content. (Chen,2021, p. 104.) This will ensure that websites load faster on smartphones when executed properly, leading to increased customer satisfaction. Additionally, since the vast majority of mobile devices are battery-powered, businesses need to take steps to ensure that their website doesn't waste battery. One of the first goals of this study was to learn more about designing innovative and eco-friendly websites.

4.2 Digital transformation in businesses

When it comes to business marketing strategies, previous studies have shown important drivers of digital transformation. Digital transformation experts go into great detail on how digital technologies are used, including how they fit into everyday life and critical business processes. According to the findings, digital transformation has demonstrated the potential to change the business model and strategy of Uber and Amazon at scale (Glaser & Shaw, 2022). Amazon and Uber have taken the traditional core businesses of retail and transportation and imbued them with business transformation; Digital technology sets them apart from the competition. Overall, digital transformation has had a global impact on core businesses.

To stay afloat in an enterprise, it is necessary to integrate the variation of internal processes with the external change of market trends and environmental dynamics (Globocnik et al., 2020, p.65.). To implement new digital methods, automated tools, etc. to ensure that business growth and expansion impacts on a global scale, certain business decisions need to be made. Internal operating models and policy frameworks must innovate to achieve expected productivity principles within the time frame to achieve business goals (Sjodin et al., 2021.p.109.). End-to-end customer interactions are managed by directing automation techniques and optimization processes. The process transformation mechanism is used to manage the entire internal process, including purchasing raw materials, manufacturing products, distributing to retail stores, and selling to the end consumer market. (Fischer, 2021, p.98.) Make a business case for each unit of raw material purchased by analyzing defective materials to be returned to strategic business suppliers, units produced in production, production products are sold to the target audience, defective materials are returned based on customer complaints, etc. are enough aspects to transform processes, focusing on the stability of the company.

The nature of business and industry trends in which key strategic decisions are made drives internal transformation (Coreynen et al., 2020). Business processes require strategic meetings with stakeholders to ensure that expected productivity ratios and profit margins are integrated. Since overcoming manual processes requires starting to put together effective business strategies, design principles and operational reengineering are factors that are later incorporated into new business models (Al-Anqoudi et al., 2021, p.61.). The management of competitive strategies must emphasize the stage of effective planning and the integration of new technologies to stabilize business operations in new dimensions (Stravinskiene, 2020). One study focused shows that the successful use of company resources requires the full implementation of functional systems whereby buyer needs are balanced and internal efficiency is maintained (Kennedy and Linnenluecke, 2022, p.110.).

4.3 Sustainable advancement and their impact on consumer behaviour

The economy's distribution channels and interactions between consumers and manufacturers are profoundly changing due to the global digital transformation (Almeida et al. 2020. P,97.). The digitalization of the company's external communication is necessary to promote sustainability in the face of the digital evolution of consumer behaviour. Through product rating and review systems, consumers now have greater power to influence both manufacturers and products, and this evolution has made product reviews and ratings a challenge. An important part of the decision-making process is when consumers are in control thanks to new technologies. They can access information at any time and order goods and services whenever they want. Customers now have more options to communicate with and share their thoughts with colleagues via social media (Ansari et al. 2019, p.10.). Businesses often change quickly in response to changes in consumer behaviour and technology.

Consumers are more connected to businesses than ever before is a key impact of digital sustainability on consumer behaviour (Nayal et al., 2022,p.56.). They can research products, ask about sales, and make purchases using their smartphones, no matter where they are or what they are doing. For example, technology and connected devices have dramatically changed commute times by train or bus. Social media is used by customers to communicate with and ask questions about customer service but also as a tool to help them make purchases (Aji et al. 2020, p. 104-109.). A strong presence on social media and online is essential for to capitalize on this shift in consumer behaviour.

Second, sustainable digital technology has raised customer expectations to unprecedented levels. Customer’s rate a company's shopping experience against that of competitors and online businesses based on the growing and set by digital pioneers (Vidili 2021, p.183.). Companies that sell products and services to customers expect to communicate with them in a more timely, relevant, and targeted manner. When a customer is forced to wait for a response from a particular company's customer service, his behaviour changes and he feels bad. For this reason, customers are looking for a competitor that offers a superior experience. The more digitally sustainable a company is, the more likely its customers are to do well.

Third, customer behaviour has changed due to the prevalence of modern digital technologies in all human activities and interactions with the environment. Customers now have access to vast amounts of information about products and services, such as reviews from experts and general users, the ability to compare prices and features, and descriptions (Lee et al. 2021, p.43.). Product details include graphic images and videos. Customers can find and order food from local producers, and they can buy items from anywhere in the country or around the world. Social media is often used by young customers to search for products and services they need. The growth of digital aids and conversational user interfaces has led to an increase in the frequency of searches using voice comm and voice activation options.

4.4 Implementation of web services in businesses

Compared to other businesses that are less specialized in the use of electronic marketing or information and communication technology (ICT), the use of ICT in conjunction with marketing activities plays an important role in enabling companies to operate on a global scale and to be a source of growth companies for a sustainable competitive advantage (Fayyomi et al., 2021, p.109.). The Internet has also enabled a company's marketing departments to communicate with potential customers by reducing communication costs, from "one-to-one" to "many-to-many", both tangible and intangible (Bosah, 2022, p.35.). However, the high level of competition and the abundance of product choices in the market have made it difficult to achieve high profit margins in knowledge-based economies. Sales cycles and decision-making times begin to shorten, so there is a need to quickly adapt to the modern business environment and integrate Internet-based marketing strategies into business processes. There are three types of web services:

4.4.1.1 Company information

Customers and other businesses share information with a business. In this case, the company, its scope of activities using Web services. News feeds, stock quotes, and weather reports are all examples of business information web services.

4.4.1.2 Business integration

The client pays for the trading services provided by a company. In this case, the company joins a global network of value-added providers that can be used for business. Reservation systems, e-procurement, and bidding and credit-checking marketplaces are examples of business-integrated web services.

4.4.1.3 Outsourcing business activities

By establishing a global value chain, a company stands out from the competition. In this case, the company dynamically integrates its processes through the use of web services. (Chawla 2020, p.184.) Associations between different businesses that combine the manufacture, assembly, wholesale and retail distribution of a particular product are an example of outsourcing business processes through web services.

4.5 Certifications for online services

Online services are growing at breakneck speed and there are many global business opportunities. The increase in online shopping and internet penetration is driving the expansion of online services worldwide. If an online business wants to streamline its operations and easily acquire new customers, ISO certification is an essential option to consider ((Sunyaev & Sunyaev, 2020, p. 195.). Here are three certifications:

4.5.1.1 ISO 27001 (Information Security)

The majority of businesses online are concerned about cyber-attacks and data breaches. An essential step to successfully running an e-commerce business is protecting important information, such as customers' personal information. The best ways to build a robust information security management system are described in the ISO 27001 standard (Roy, 2020, p.98.).

ISO 27001 is an internationally accepted standard for information security management systems that promotes a methodical strategy for protecting confidential data. The standard specifies a number of conditions that must be met by an organization’s Information Security Management System (ISMS) in order to be considered compliant with the standard. Protections against the loss, misuse, or disclosure of private data, as well as its modification, deletion, or unauthorized access, are all part of this.

ISO 27001 may play an important role in preserving the privacy, security, and accessibility of data sent over the Internet in the context of Sustainable Web Usage and Services. (Coreynen, 2021, p. 165.) This is crucial because of the private nature of information sent via the internet and the dangers posed by cyberattacks and data breaches. With ISO 27001 in place, businesses can rest easy knowing they're taking every precaution to protect their customers' personal information, money, and ideas online.

ISO 27001 also encourages the ethical use of digital resources, which may help ensure the continued availability of online services. Data loss and corruption may be avoided, helping businesses save money and have less of an effect on the environment by taking a methodical approach to managing information security (Roy, 2020, p.98.). The sustainability of the digital ecosystem as a whole may also benefit from ISO 27001's capacity to assist businesses in meeting the requirements of data protection, privacy, and cybersecurity laws and regulations.

4.5.1.2 ISO 9001 (Quality)

Quality Management System (QMS) best practices are provided by ISO 9001 certification, the world's best certification (Barbosa et al., 2022.p,159.). It provides a system for quality-driven associations to convey to regulators that meet the needs and assumptions of all current and prospective buyers in the most efficient manner possible. Simply put, it is a flexible standard that can be used in many contexts. By complying with ISO 9001 standards, one can achieve ISO 9001 certification.

The quality of your products and services is essential to the success of an online digital business. ISO 9001 encourages the development of a quality management system to monitor all departments and activities of the company. Companies can achieve improved internal management, consistent and measurable results, and increased productivity with the necessary support from employees and other stakeholders (Chawla and Kumar, 2022, p.79.). When it comes to achieving business excellence, SMEs benefit greatly from the trust of their customers. With standardized products and services, ISO certification enables companies to create value in the global online marketplace. Every e-commerce business needs to manage customer queries effectively. It is essential for the success of online services and helps in better business management. ISO 9001 lays out rules for faster processing of customer requests, monitoring of claims tracking, management requests, and fast-food execution (Stark, 2020, p.291.).

As a result through standardization, customer confidence increases and product quality remains consistent. It demonstrates the association's ability to reliably convey excellent workmanship and products as guaranteed by a successful business framework that takes into account applicable rules while interacting to reduce opportunities and retain consumers. (Globocnik, 2020, p.116.) The market recognizes a company's and when it receives an ISO certificate. Establish a lasting business reputation symbolized by the ISO Certification logo. In addition, and openness to the market develop when the quality, creativity and reliability of the authority or product are assured.

ISO 9001 is a standard that focuses on quality management systems (QMS) in organizations. The standard emphasizes the importance of customer satisfaction and continuous improvement of processes and products. In the context of sustainable web usage and services, ISO 9001 can help organizations ensure that their web services meet the needs and expectations of their users while also taking into account the impact on the environment and society. ISO 9001 requires organizations to establish and maintain a QMS that is focused on meeting customer requirements and improving customer satisfaction. This includes setting measurable objectives and continuously monitoring and evaluating the performance of processes and services (Chawla & Kumar, 2022, p.79.). By applying these principles to sustainable web usage and services, organizations can ensure that their web services are designed and delivered in a way that minimizes their environmental impact while still meeting the needs of their users. ISO 9001 also requires organizations to engage in continuous improvement by identifying areas for improvement and taking action to address them. (Garel, 2021, p.101.) This can include incorporating sustainability principles into the design and delivery of web services and regularly evaluating the impact of those services on the environment and society.

5 Conclusion

The research Finding indicates that the applications related to the guidelines of current eco-friendly web design, which was proposed by (Galanakis, 2023, p.124.), lead to the digital-based product, which is considered appealing by all the users. The deeper knowledge related to the study results in the conclusion that all the application related to web design guidelines is considered context dependable. This paper examines the concept related to sustainable web services, including an approach to internet products and resources with a focus on sustainability and social justice. (Glaser, 2022,p.110.) In addition, a study found that energy-efficient products and services are faster and hence ensure improved user experience, conveniently accessible on weak connections, and affordable enough to consume by every member of society, even to the lowest-income individuals. Moreover, it was seen that the larger Corporate Digital Responsibility (CDR) strategy, which incorporates social, economic, environmental, and technical initiatives, also includes sustainable web design. The principles of sustainable web design may be used to optimize and boost the performance of any app, website, or online media. The current study has emphasized all the sustainable web services development and its exploitation in the businesses as a whole transformation, maximizing the management's benefits.

In conclusion, in today's society, when technology plays such a crucial part in many facets of life, the adoption of dependable web-based support is of paramount importance. Sustainability in online services refers to the use of methods to boost efficiency and inclusion while decreasing the negative effects that technology has on the environment. (Fuller, 2019, p.78.) The literature study emphasizes the significance of organizational performance, technological advancements, digitized communication, and government regulations in fostering long-term online use and service provision. The possible negative effects of online solutions and services on the environment and society are also discussed. Sustainable practices and solutions may help companies and organizations maximize their advantages while minimizing their negative effect in many areas, including energy efficiency, renewable energy, and social and economic activities. Overall, a comprehensive approach that includes environmental, social, and economic considerations is necessary for the idea of sustainability in online services. Sustainable web services have the potential to improve online efficiency and accessibility while also lowering their overall environmental footprint and fostering long-term social benefits.

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