Web Application to Help People Find and Support Sustainable Businesses

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1 Paper 1: Technology-Based Strategies for Online Secondhand Platforms Promoting Sustainable Retailing

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [1]

1.1 Summary

The study demonstrates that well-designed technology and UX/UI features play a crucial role in enhancing the online secondhand shopping experience, making it more convenient, enjoyable, and attractive to users. It collected data from a survey of active users and found that: (1) Users value features like a multilayered review and rating system, in-app verification, and personalized recommendations. (2) These features enhance perceived usefulness, ease of use, and enjoyment. (3) Users find secondhand shopping more interesting and enjoyable with these features. (4) The features influence users' intentions to use online secondhand platforms. (5) Almost half of the users agree that these features have led them to use the platform.

1.2 Software Architecture

The Technology Acceptance Model (TAM) is a framework for understanding user acceptance of technology. It hinges on two factors: perceived usefulness (effectiveness) and perceived ease of use. TAM helps predict user adoption and acceptance of new software and systems.

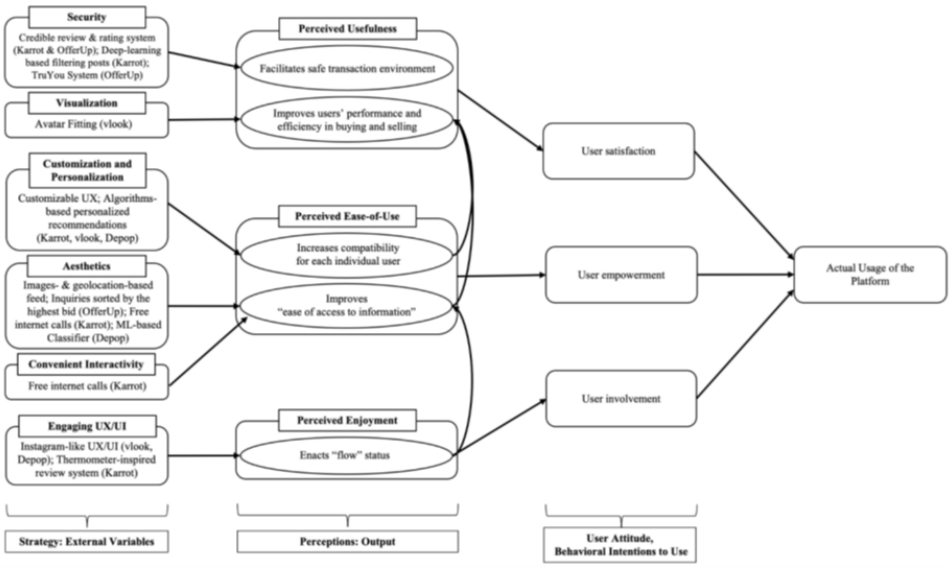


Figure 1: Software architecture diagram for Paper 1.

1.3 Data Parameters

The research materials consist of survey data, which encompasses user evaluations of diverse strategies employed by online secondhand platforms. These strategies are appraised based on user perceptions, encompassing their assessments of usefulness, ease-of-use, and enjoyment. The responses are rated for agreement using the Technology Acceptance Model (TAM) and involve measures of perceived usefulness (PU), perceived ease-of-use (PUI), and perceived enjoyment (PE) on a defined scale. While the study doesn't specify particular participant demographics, it does confirm the absence of significant gender-based distinctions among the respondents. Additionally, the research incorporates interview data from experts, including a CEO of an online secondhand platform and a university professor specializing in the Department of Human Environment and Design.

1.4 Datasets Used

The research presents statistical data and graphs related to user perceptions and agreement ratings for various strategies. These findings are as follows:

• Figure 2: This graph illustrates the influence of overall strategies on users' intentions and actual usage of secondhand platforms.

• Evaluation data for strategies based on the TAM model, presenting frequencies and percentages of agreement for each strategy in terms of perceived usefulness (PU), perceived ease-of-use (PUI), and perceived enjoyment (PE).

• 82.7% of Users: This statistical figure represents the percentage of users who see a strong correlation between technology usage and UX/UI features and enhanced user online secondhand shopping experience.

• Top Three Features: The top three features considered most likely to improve user experience are the multilayered review and rating system (70.4%), the fortified transaction process (42%), and better-personalized recommendations (34.6%). These percentages are based on user responses.

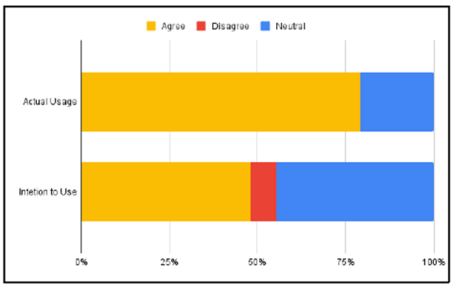


Figure 2: Datasets Supplement 1 for Paper 1

1.5 Paper Link

Access the full paper at https://www.mdpi.com/2071-1050/14/6/3259.

2 Paper 2: SEER: Sustainable E-commerce with Environment impact Rating

Journal/Conference Rank: Q1
Publication Year: 2023
Reference: [2]

2.1 Summary

This research paper, "Sustainable E-commerce with Environmental-impact Rating (SEER)," aims to bridge the gap between people's good intentions to shop sustainably online and their actual behavior. It introduces the SEER concept, which rates products' environmental impact on E-commerce platforms to make eco-friendly choices more convenient for users. The key findings are:
1. There is a gap between people's intentions to shop eco-friendly and their actual behavior.
2. SEER effectively encourages eco-friendly shopping, as shown in a study with 98 participants.
3. SEER can reduce the environmental impact of online shopping and raise awareness of climate change.
The study explains the SEER design and how it was tested. It focuses on improving online shopping for the environment.

2.2 Software Architecture

The software architecture of SEER includes three components: environmental rating, environmental impact summary, and environmental keyword highlights. These components work together to provide users with information about the environmental impact of products and help them make eco-friendly choices. The study found that SEER effectively encourages eco-friendly shopping and reduces the attitude-action gap in online shopping.

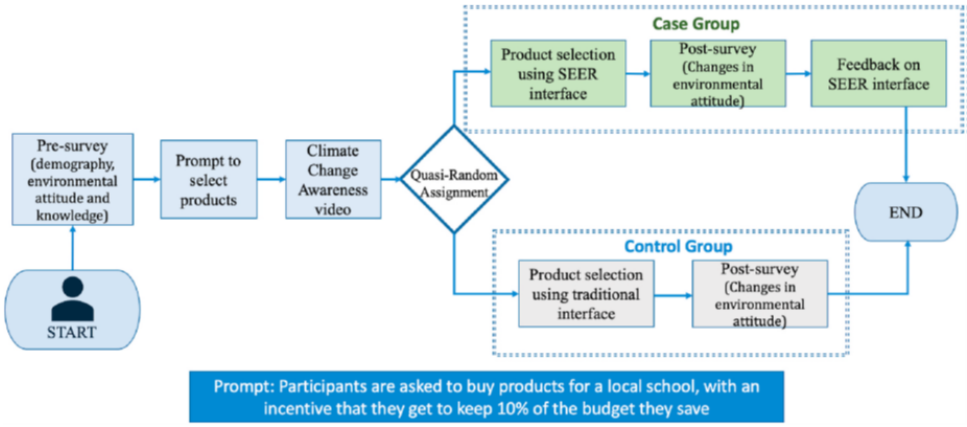


Figure 3: Software architecture diagram for Paper 2

2.3 Data Parameters

The research investigates correlations between independent variables (e.g., gender, age, education level, income, environmental sentiment score, and knowledge) and the target variable (eco-friendliness). Different statistical tests, including ANOVA, t-tests, and Pearson correlation coefficients, are used to measure the relationships and significance of these variables. For categorical variables, ANOVA tests are employed, while numerical variables are assessed using Pearson correlation coefficients. The System Usability Scale (SUS) score is also used to assess the usability of the SEER prototype.

2.4 Datasets Used

The research analyzed a dataset to understand eco-friendly shopping behavior and the impact of a tool called SEER. Here's what the data revealed:
• Sentiments: Most participants had a positive attitude toward eco-friendliness (74.5%).
• Attitude vs. Action: People who intended to be eco-friendly didn't always act that way. Sentiment didn't strongly influence behavior (r = 0.088).
• Knowledge Matters: People who knew more about eco-issues were more likely to make eco-friendly choices.
• SEER's Impact: The tool SEER helped users make more eco-friendly choices, and participants found it user-friendly (SUS score 79.18).
• Price Matters: When eco-friendly items were much more expensive, fewer people chose them.

2.5 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S2666789422000356.

3 Paper 3: Digital sustainable business models: Using digital technology to integrate ecological sustainability into the core of business models.

Journal/Conference Rank: Q1
Publication Year: 2023
Reference: [3]

3.1 Summary

This research underscores the growing importance of ecological sustainability for businesses, emphasizing that it can coexist with economic success. Profitable start-ups demonstrate that digital technology can seamlessly integrate ecological sustainability into their business models. For established companies, achieving digital and ecological business model transformations is essential. Digital technology plays a pivotal role in this dual transformation. By studying 31 start-ups, the research identifies four archetypes of digital sustainable business models, illustrating how digital technology can create ecological, economic, and technological sustainability. In essence, this research advocates

that ecological and economic sustainability can work together through digital technology, offering strategies to facilitate this transformation and support a more sustainable future.

3.2 Software Architecture

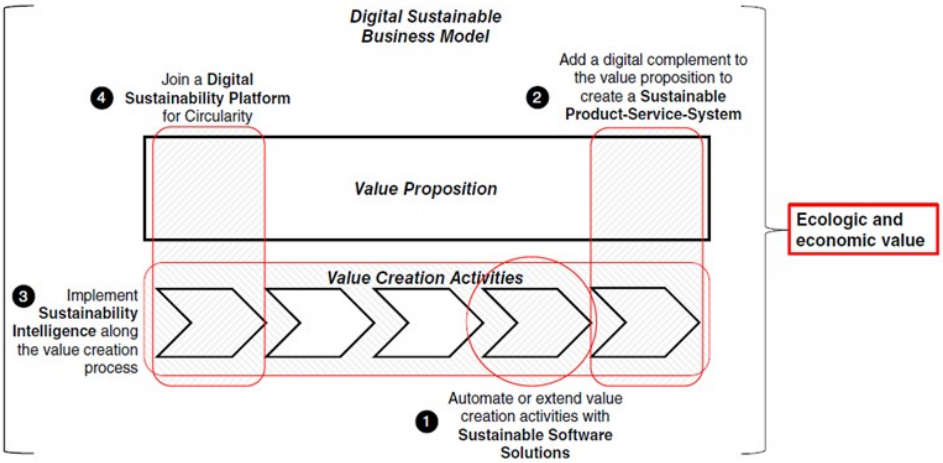


Figure 4: Software architecture diagram for Paper 3.

The software architecture consists of a taxonomy of digital sustainable business models and four archetypes. The taxonomy categorizes models into Value Proposition, Value Creation and Delivery, and Revenue Model, with multiple dimensions and characteristics. The archetypes are Sustainable Software Solution, Sustainable Product-Service System, Sustainability Intelligence, and Digital Sustainable Platform, offering various approaches to enhance ecological sustainability using digital means. They optimize resource efficiency and value capture through different revenue models. This architecture classifies and analyzes digital sustainable business models based on ecological, economic, and technological aspects.

3.3 Data Parameters

The research investigates technology, ecology, and economics in the context of 50 European start-ups with ecological sustainability value propositions. It introduces a taxonomy with three categories: Value Proposition, Value Creation and Delivery, and Revenue Model. Additionally, the study identifies four digital sustainable business model archetypes: Sustainable Software Solution, Sustainable Product-Service System, Sustainability Intelligence, and Digital Sustainable Platform.

3.4 Datasets Used

- Sample Size: Initially 50 start-ups, reduced to a final sample of 31.
- Data Sources: Utilized Crunchbase, LinkedIn, Dealroom, and news articles.
- Inclusion Criteria: Included start-ups between 4 and 10 years old with ecological sustainable value propositions.
- Geographical Focus: Sample limited to European start-ups for comparability.

3.5 Paper Link

Access the full paper at https://onlinelibrary.wiley.com/doi/10.1111/isj.12436.

4 Paper 4: Circular economy e-business model portfolio development for e-business applications: Impacts on ESG and sustainability performance.

Journal/Conference Rank: Q1
Publication Year: 2023
Reference: [4]

4.1 Summary

This research focuses on the role of the circular economy in promoting sustainability in the digital era. Circular economy businesses are contributing significantly to GDP and employment. The paper proposes a circular economy e-business model that enhances environmental, social, and governance (ESG) performance. This model leverages technology to reduce operational costs, minimize environmental impact, and maximize social and economic benefits. The circular economy, as opposed to the linear "take-make-dispose" model, offers cost-saving opportunities and substantial job creation, emphasizing the importance of sustainable practices. The research explores the state-of-the-art circular economy e-business model and the development of agile e-business solutions tailored to specific organizational needs, with a focus on Indonesia as a case context. Digitization through e-business is seen as a crucial enabler of sustainable circular economies, but challenges such as skills and technology adoption need to be addressed for its successful implementation.

4.2 Software Architecture

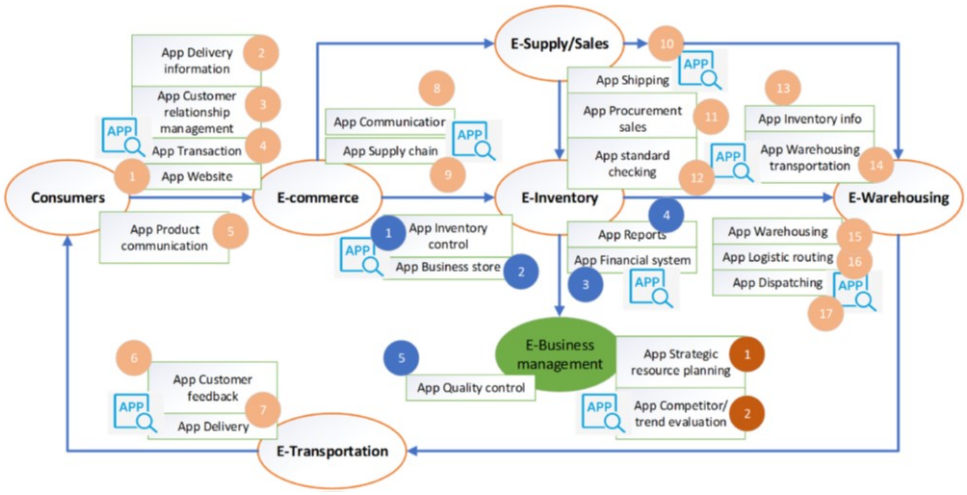


Figure 5: Software architecture diagram for Paper 4.

This model represents a holistic approach to developing software architectures for circular economy e-business systems. It combines domain engineering and application engineering to create tailored solutions that address the unique requirements of circular economy businesses while focusing on sustainability and resource efficiency.

4.3 Data Parameters

The research covers several crucial aspects of e-business. Firstly, it provides revenue projections for e-business markets in countries like Indonesia, Thailand, Malaysia, Singapore, and India. It also delves into how e-business influences customer satisfaction and behaviors, highlighting its impact. Additionally, the study explores the environmental challenges tied to e-business, including issues like waste generation, packaging, energy consumption, and sustainable materials. Emission reduction is emphasized as an environmental goal, alongside the concept of material efficiency, which involves using recycled materials. The research underscores the importance of technology in e-business, encompassing data management, cybersecurity, and IT infrastructure. It also addresses digital literacy's role in shaping customer habits. Moreover, it discusses how e-business facilitates global interactions and marketing. Lastly, the research touches on regulatory implementation, including taxes, tariffs, and intellectual property protection, as well as the challenges posed by the legal framework in the e-business circular economy.

4.4 Datasets Used

The dataset explored in this research primarily pertains to economic data related to the e-business markets in countries like Indonesia, Thailand, Singapore, and India. The economic projections indicate substantial growth in these markets. For instance, in Indonesia, the e-business market's revenue is expected to increase from US $30,309 million in 2020 to US $56,358 million by 2025, reflecting a 13.2% annual growth rate. Thailand's e-business market is projected to rise from US $7,288 million in 2020 to US $12,319 million by 2025, growing at an annual rate of 11.1%. Similarly, Singapore's e-business market revenue is anticipated to reach US $2,405 million in 2020, with an expected 11.1% growth rate, aiming for a market volume of US $4,079 million by 2025. India's e-business markets are poised for substantial growth, with an estimated size of approximately $188 billion by 2025, expected to further increase to $350 billion by 2030. These numbers depict the considerable economic significance of e-business in these countries and underscore the need for sustainable e-business practices to support this growth.

4.5 Paper Link

Access the full paper at https://https://www.sciencedirect.com/science/article/pii/S0959652623016864

5 Paper 5: Traceability Platform Based on Green Blockchain: An Application Case Study in Dairy Supply Chain.

Journal/Conference Rank: Q1
Publication Year: 2022

Reference: [5]

5.1 Summary

This research focuses on the technical aspects of a "Green Blockchain" traceability platform for the dairy supply chain, particularly Fontina PDO cheese. It employs Algorand Blockchain, known for its energy-efficient Pure Proof-of-Stake consensus mechanism. Key technical elements include digitizing the production chain, ensuring real-time data access, and utilizing blockchain's security features through decentralized data storage. This approach aims to enhance traceability while minimizing energy consumption.

5.2 Software Architecture

5.2.1 Blockchain Network

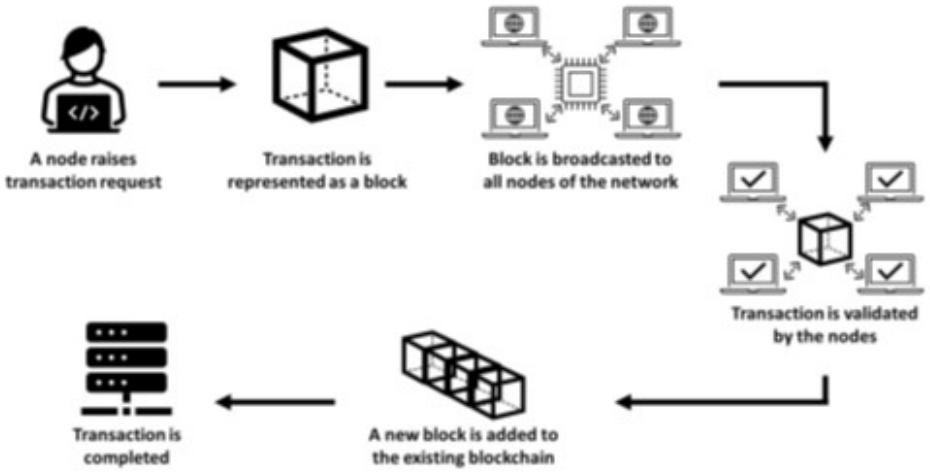


Figure 6: Software architecture diagram 1 for Paper 5.

In the Blockchain transaction process, a user requests a transaction that's represented as a block, sent to a network of nodes for validation, added to the blockchain for permanence, and concludes the transaction, ensuring secure and unchangeable data recording.

5.2.2 Traceability platform

The Fontina PDO supply chain traceability platform offers accessible data recording and monitoring. It consists of a back-end framework, an RDBMS (MySQL on AWS), and Algorand Blockchain for its energy efficiency. This architecture serves quality assurance, promotion of Fontina PDO cheese, and allows consumer access to transaction data.

5.3 Data Parameters

System parameters in this context include the choice of the back-end framework, represented by Django, and the utilization of MySQL as the Database Management System (RDBMS) for data storage. The adoption of Algorand Blockchain, characterized as an energy-efficient solution with low transaction costs due to its Pure Proof of Stake consensus algorithm, is another vital system parameter. These parameters reflect the platform's

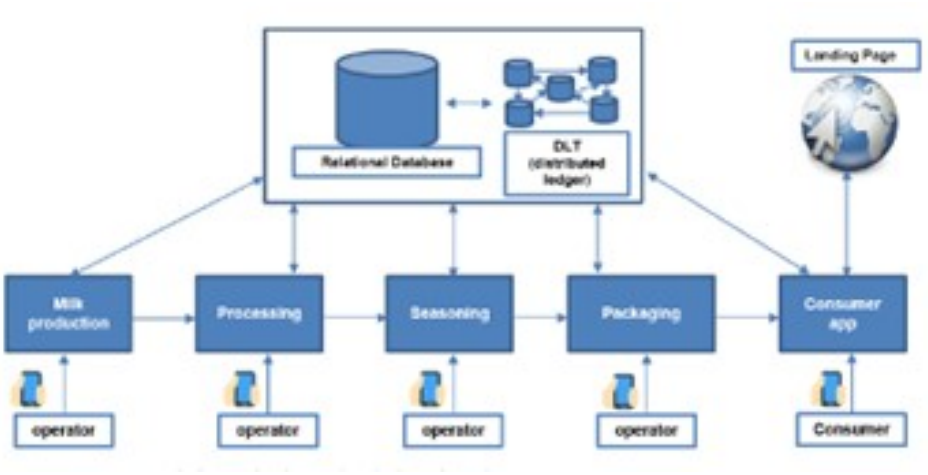


Figure 7: Software architecture diagram 2 for Paper 5.

technical foundations. Additionally, the emphasis on minimizing energy consumption and transaction costs highlights efficiency and sustainability considerations. Finally, specific transaction fees, such as 0.001 Algo per transaction for the Algorand Blockchain, underscore cost-related system parameters.

5.4 Datasets Used

- Ride start 2021-01-19 Time 05:29:06 am
- Tour id: 1
- Driver id: 101
- Vehicle XN***8

Farmer Code	Time	Liters	Temp	Nr
000051	05:50	188.2	29.3	001
000128	05:50	25.85	26.0	002
000104	06:07	208.2	26.2	003
000081	06:11	17.20	22.3	004
000042	06:26	295.0	29.5	005
000125	06:43	46.70	27.6	006
000038	06:50	181.7	30.1	007
000126	06:55	248.8	26.3	008

- Ride end 2021-01-19 Time 07:02:13 am
- Total receptions: 008
- Total milk volume: 1211.65 (liters)

Figure 8: Datasets Supplement 1 for Paper 5

The provided data set offers valuable insights into the milk production phase of the Fontina PDO cheese supply chain. It includes essential numerical information such as unique farmer codes, timestamps for milk collection, the quantity of milk supplied in liters, temperature records, and milk delivery identifiers. These details are integral to ensuring the quality and traceability of the raw materials involved in the production of Fontina PDO cheese. The dataset captures the critical steps of milk collection, which play a vital role in maintaining the high standards of this renowned cheese product.

5.5 Paper Link

Access the full paper at https://www.mdpi.com/2071-1050/14/6/3321.

6 Paper 6: Supporting Sustainability by Promoting Online Purchase through Enhancement of Online Convenience

Journal/Conference Rank: Q1
Publication Year: 2020
Reference: [6]

6.1 Summary

The paper explores the potential of online shopping in promoting environmental sustainability by increasing business' online presence. To investigate this, a snowball sampling method was utilized to collect data from 226 participants. The data was analyzed using Least Squares Structural Equation Modeling (PLS-SEM) to examine the research hypotheses. The results indicate that customers with prior online shopping experience significantly influence the connection between service convenience and customer satisfaction. Furthermore, satisfied customers express a stronger desire to prolong their online engagement and are willing to spend more. This study contributes to the existing body of knowledge by expanding on previous research that indicate consumers may prefer to shop online due to greater availability, time efficiency, and convenience. It also uncovers how consumers may be willing to pay more online and desire to remain engaged. These findings offer valuable insights for both environmentally conscious consumers and sustainable businesses in terms of how they may reach each other, and mutually benefit through digital means.

6.2 Software Architecture

Environmentally conscious consumers interact with a webpage designed by the retailer, which is optimized for search (ease of finding desired products), access (ease of finding the business and website), evaluation (ease of understanding and navigation), transaction (ease of making a purchase), possession (ease of receiving the product), and decision (ease of making decisions) convenience. These are facilitated by an E-Commerce management system. The outcome of these conveniences is heightened consumer engagement, satisfaction, and retention. Access convenience is of particular interest due to the relevance of other conveniences being directly reliant on users finding and accessing the website.

6.3 Data Parameters

The figure represents model path coefficients, to test and estimate complex relationships among the data set (see next section). This involves representing the degree of direct influence (in terms of behavioral intentions, willingness to increase expenditure, and consumer engagement and retention) which the variables collected and evaluated have on consumer satisfaction in using the online application (i.e.: finding the business and

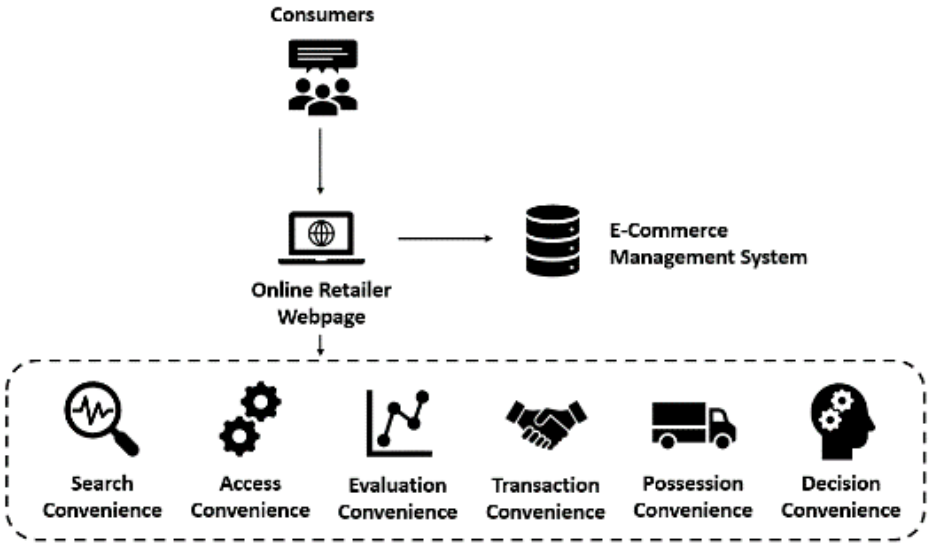


Figure 9: Software architecture diagram for Paper 1.

website, searching and purchasing products, receiving the product, and ease of use of the website).

Figure 10: Data Parameters Supplement 1 for Paper 6

Other parameters used in this paper are relevant to the discriminant validity of the variables, to assess whether two different constructs or variables are distinct or underlyingly related. The table below once again reiterates the importance of access convenience – the ease and ability to find the business and its website in the first place – before other variables become relevant.

6.4 Datasets Used

The study gathered data through an internet-based survey containing 52 inquiries. This survey was created and published in December 2018, and it remained accessible online for

Table 3 Discriminant validity

Construct	ACC	BEHA	DC	EVA	EXP	PAY	POS	PPOS	SEA	SAT	STAY	TRA
ACC	**0.936**											
BEHA	0.773	**0.910**										
DC	0.788	0.815	**0.942**									
EVA	0.739	0.755	0.824	**0.887**								
EXP	0.706	0.839	0.783	0.740	**0.917**							
PAY	0.517	0.598	0.592	0.523	0.672	**0.867**						
POS	0.844	0.833	0.881	0.799	0.770	0.546	**0.890**					
PPOS	0.691	0.738	0.796	0.743	0.734	0.537	0.826	**0.908**				
SEA	0.875	0.808	0.850	0.882	0.758	0.560	0.863	0.746	**0.894**			
SAT	0.749	0.907	0.807	0.783	0.847	0.612	0.819	0.778	0.820	**0.919**		
STAY	0.591	0.821	0.652	0.646	0.770	0.638	0.648	0.622	0.662	0.781	**0.896**	
TRA	0.816	0.817	0.864	0.850	0.766	0.562	0.905	0.825	0.873	0.826	0.638	**0.831**

The square root of the average variance extracted (AVE) is reported in bold between on the main diagonal

ACC access convenience, *BEHA* behavioral intentions, *DC* decision convenience, *EVA* evaluation convenience, *EXP* experience, *PAY* willingness to pay, *POS* possession convenience, *PPOS* post-possession convenience, *SEA* search convenience, *SAT* satisfaction, *STAY* desire to stay; *TRA* transaction convenience

Figure 11: Data Parameters Supplement 2 for Paper 6

a duration of 10 weeks. The intended participants were of Chinese origin and a language expert was enlisted to translate the questionnaire into Chinese in order to minimize any potential misinterpretations and enhance the likelihood of obtaining responses. The survey used the snowball technique, where participants were encouraged to pass it on to their contacts. In total, 235 responses were collected, with 9 responses excluded where individuals had not made online purchases in the past 6 months. Therefore, the final valid sample consisted of 226 responses. Among the respondents, 58% were females, and 42% were males, primarily aged between 20 and 30 years old (73.9%), with the majority (94.2%) holding a college degree. Questions were designed to evaluate consumer convenience (in various forms), satisfaction, expenditure and behaviour patterns, and retention relevant to using online platforms of commerce. The evaluation of the suggested model followed a two-step procedure. Initially, the measurement model was examined using the Partial Least Squares-path modeling technique to validate the measurement quality. Once the quality of the measurements was confirmed, the structural model was assessed.

6.5 Paper Link

Access the full paper at https://link.springer.com/article/10.1007/s10668-020-00915-7 .

7 Paper 7: Digital sustainability communication in tourism

Journal/Conference Rank: Q1
Publication Year: 2019
Reference: [7]

7.1 Summary

Tourism and hospitality enterprises on a global scale are progressively shifting towards offering more sustainable services. This paper focuses on evaluating the digital sustainability communication efforts of small and medium-sized providers and their correlation with the level of sophistication in their online presence. To accomplish this, the study collected data from the websites of 759 accommodation providers situated on São Miguel Island in the Azores, a destination recognized for its commitment to sustainability. Findings reveal that local accreditations are more frequently employed than international ones

although international accreditations have greater influence, and smaller enterprises tend to prioritize eco-labeling in their online promotional efforts. Additionally, it is observed that sustainability achievements receive greater emphasis on websites with higher levels of sophistication. This research allows for better understanding into how sustainable businesses may be identified and such how practices may be communicated to consumers in digital platforms.

7.2 Software Architecture

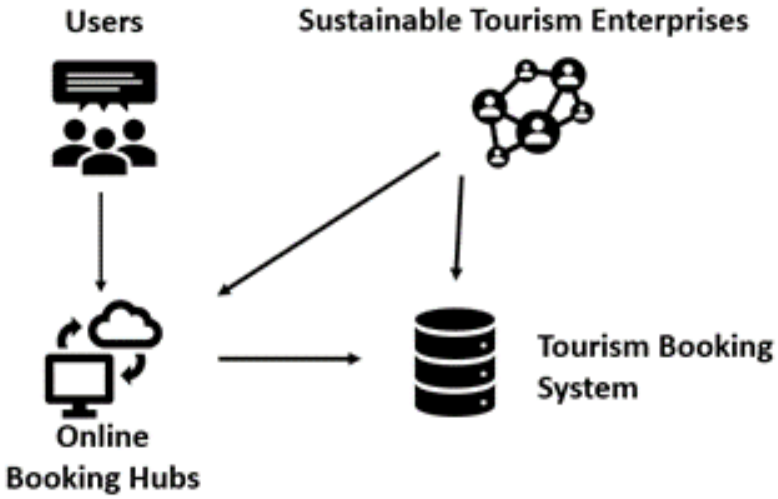


Figure 12: Software architecture diagram for Paper 7

Refer to Software architecture diagram for Paper 2; Users and sustainable tourism enterprises are facilitated by online booking hubs, powered by a central Tourism booking system.

7.3 Data Parameters

The business' sustainability indicators were translated into economic viability, employment quality, visitor satisfaction, community well-being, cultural preservation, and resource efficiency dimensions, extracted from accommodation provider websites. The database was structured with a binary matrix. Sustainability practices were assessed, and only 5.14% of accommodations displayed sustainability indicators. Nine accommodations had dedicated sustainable pages or were working towards international certifications. Others held eco-labels or sustainability certificates. After assessing the models for two clusters, a PLS multigroup analysis was conducted (Table) which shows that the group that shows a more sophisticated online presence shows higher levels of sustainability practices. This indicates that businesses with sustainability practices tend to have a rich online presence. Data parameters also enforce that most consumers tend to find such businesses on hub-like platforms (e.g.: booking platforms hosting multiple companies).

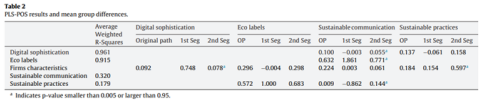


Table 2
PLS-POS results and mean group differences.

	Average Weighted R-Squares	Digital sophistication			Eco labels			Sustainable-communication			Sustainable practices		
		Original path	1st Seg	2nd Seg	OP	1st Seg	2nd Seg	OP	1st Seg	2nd Seg	OP	1st Seg	2nd Seg
Digital sophistication	0.961							0.100	−0.003	0.055[a]	0.137	−0.061	0.158
Eco labels	0.915							0.632	1.861	0.771[a]			
Firms characteristics		0.092	0.748	0.078[a]	0.296	−0.004	0.298	0.224	0.003	0.061	0.184	0.154	0.597[a]
Sustainable communication	0.320												
Sustainable practices	0.179				0.572	1.000	0.683	0.009	−0.862	0.144[a]			

[a] Indicates p-value smaller than 0.005 or larger than 0.95.

Figure 13: Data Parameters Supplement 1 for Paper 7

7.4 Datasets Used

The study encompassed 759 authorized accommodations offering a total of 9,910 beds. Each accommodation's online presence was evaluated, considering their representation on booking platforms. Most accommodations (89.4%) were small businesses, primarily bed and breakfasts or guest houses, predominantly owned by locals (87.8%). About a third had their websites, 11.3% used Facebook, and 1.41% used Twitter for online communication. Notably, 58% utilized specialized booking platforms like Airbnb. Approximately 20% had interactive websites, while 10% featured booking forms. The database construction in this study involved four key steps: (1) Compiling data on São Miguel tourist accommodations from structured and unstructured sources, including online descriptions. (2) Identifying existing sustainable certifications. (3) Evaluating digital sophistication of accommodation provider webpages. (4) Analyzing the correlation between digital sophistication and sustainable communication using a partial least squares model.

7.5 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S2444569X19300617.

8 Paper 8: Sustainable Marketing and Consumer Support for Sustainable Businesses

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: [8]

8.1 Summary

While many studies have examined how consumers assess the sustainability of products, there is a need for understanding how consumer values and their perceptions of a company's practices affect their support for firms that are committed to sustainable operations. This is crucial for expanding knowledge on when and how consumers may support sustainable businesses, and how firms can effectively align their marketing initiatives with consumer values and preferences in the realm of sustainability. The study employed an online survey with a substantial sample size in the United States, comprising 304 respondents. Data analysis was carried out using structural equation modeling. Key findings emerged from this study: Consumer support for sustainable businesses is influenced by (1) consumers' nature-based values, (2) consumers' attitude towards firms performing acts of benevolence, and (3) concern about the ethical conduct of firms. Notably, valuing social justice and recognizing a business's impact on one's own quality of life did not emerge as influential factors in consumers' support for sustainable businesses

8.2 Software Architecture

Refer to Software architecture diagram for Paper 8; Environmentally conscious consumers and sustainable businesses are connected via business websites which are powered by a central E-Commerce management system.

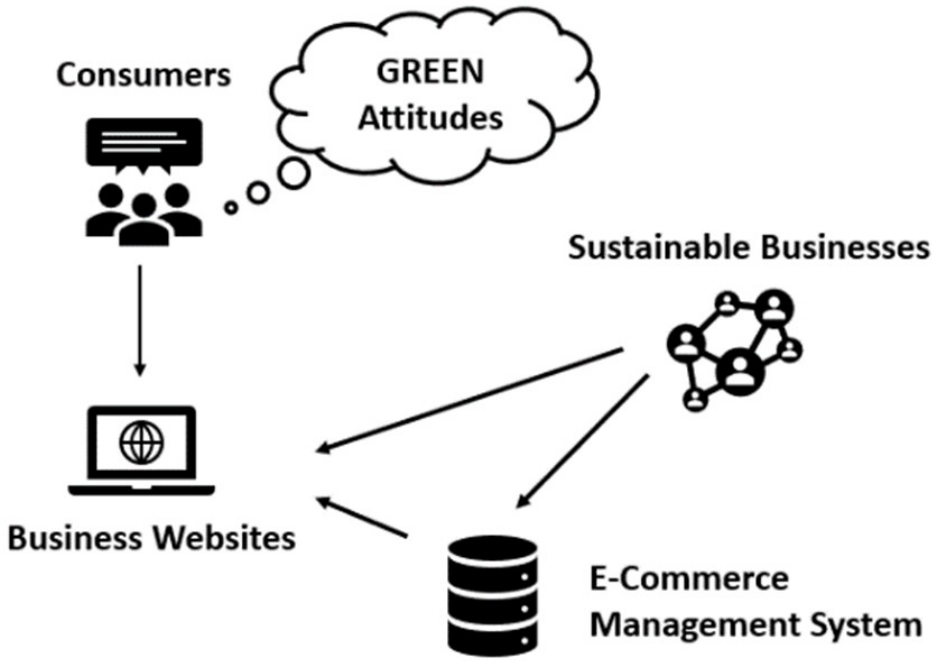


Figure 14: Software architecture diagram for Paper 8

8.3 Data Parameters

This study aimed to assess key components of the GREEN framework of sustainable marketing, focusing on five dimensions. The research utilized or adapted questions from prior studies and employed seven-point Likert-type scales for measurement. There are five GREEN dimensions used as parameters: 1. Global Societal Value Exchange: Attitude towards Business Benevolence (This construct gauges consumer attitudes toward businesses performing benevolent acts) 2. Responsible Environmental Behavior: Valuing Nature (This construct gauges the importance of nature for individuals) 3. Equitable Sustainable-Business-Practices: Valuing Social Justice (This construct gauges the importance of social justice in making decisions) 4. Ethical Sustainable Consumption: Concern about Business Ethical Practices (This construct gauges consumer views on ethical business practices) 5. Necessary Quality-of-Life & Well-being: Business Contributions to My Quality of Life (QOL) (This construct gauges the contribution of businesses to quality of life) The modeling results from these parameters are shown in the table and figure:

8.4 Datasets Used

The study involved 304 respondents from the United States and represented a diverse panel. The sample was representative in important demographic aspects, such as gender, age, ethnicity, marital status, and education, closely aligning with the 2010 US Census

Table 2
Correlation Matrix and Descriptive Statistics

	1	2	3	4	5	6
1. Valuing Nature	1.00					
2. Valuing Social Justice	.53**	1.00				
3. Attitude toward Business Benevolence	.35**	.55**	1.00			
4. Concern about Business Ethical Practices	.21**	.38**	.42**	1.00		
5. Business Contributions to My QOL	.19**	.20**	.28**	.12*	1.00	
6. Support for Sustainable Businesses	.58**	.49**	.51**	.32**	.24**	1.00
M	5.34	5.74	5.51	5.83	4.64	4.40
SD	1.06	1.05	.93	.99	.90	1.23
AVE	.59	.47	.62	.58	.50	.63
Composite Reliability	.81	.73	.91	.87	.83	.89

Notes: *$p < .05$; **$p < .01$ (two-tailed); $n = 304$ (list-wise deletion). QOL = Quality of life.

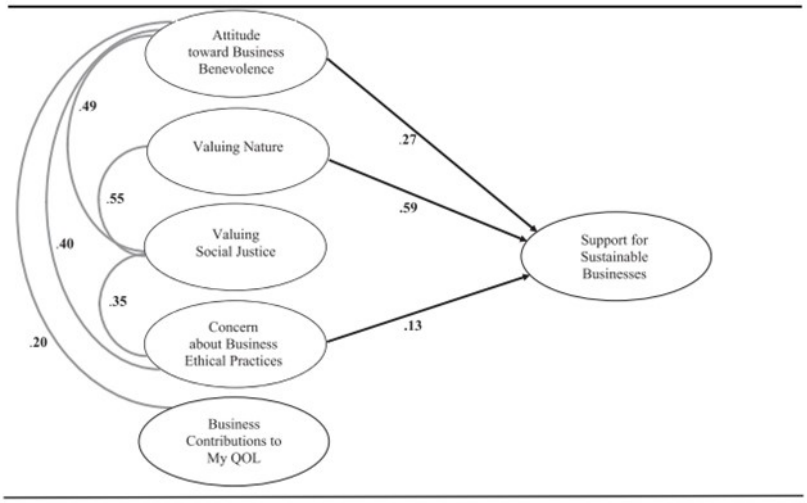


Fig. 2. Final Modeling Results (n = 304)

Figure 15: Data parameters Supplement 1 for Paper 8

data. Data was collected through an online survey, where questions involved: attitudes toward business benevolence, appreciation for nature and social justice, concerns about ethical business practices, and perception of business contributions to quality of life. The study also assessed individual support for sustainable business practices.

8.5 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/abs/pii/S2352550920313580.

9 Paper 9: Responsible digitalization through digital technologies and green practices

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: [9]

9.1 Summary

While digital technologies offer evident operational and economic advantages, they also have the potential to trigger adverse consequences for both the environment and society.

This paper addresses concerns by exploring strategies that enable businesses to attain a state of responsible digitalization. Consequently, this study focuses on discerning the correlations between digital technologies and sustainability, which shall help to discern whether web applications can be part of an appropriate solution for sustainable businesses. Furthermore, it explores how the implementation of environmentally friendly practices can enhance a company's likelihood of reaching responsible digitalization objectives. The study finds a linear relationship between specific digital technologies and CSR, ultimately leading to responsible digitalization.

9.2 Software Architecture

Refer to software architecture diagram for paper 9

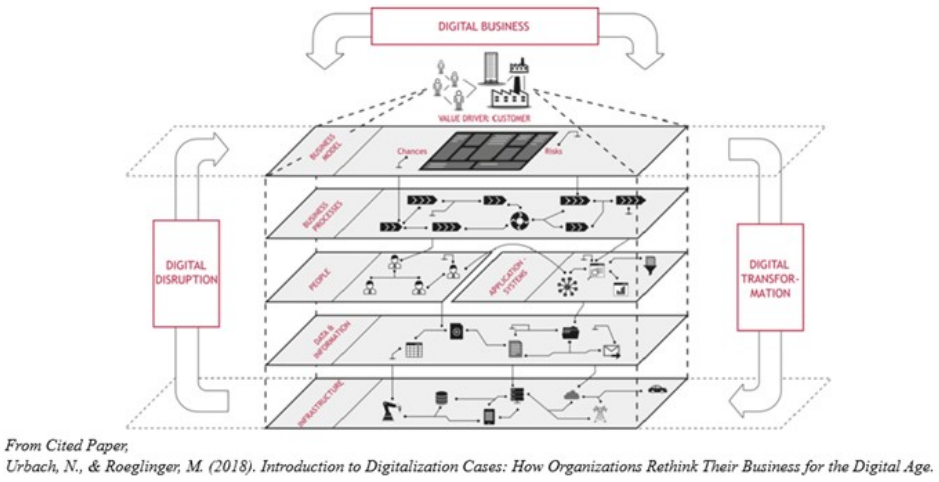


Figure 16: Software architecture diagram for Paper 9

9.3 Data Parameters

The study used a combination of various data parameters to make conclusions. These include exploratory factor analysis (to identify the latent factors that explain the patterns of correlations among digital technologies and sustainability):

It also includes a moderator analysis on the hypothesis (H2) that firms can exploit the synergies existing between digital technologies and sustainability Findings affirm a linear relationship between specific digital technologies and CSR, ultimately encouraging responsible digitalization, which could come in the form of web applications that facilitate the conduction of sustainable businesses

9.4 Datasets Used

The study used a survey aimed at gathering information about respondents' backgrounds, investments in Industry 4.0 technology, green practices, and CSR goals. The survey used a 7-point Likert scale, and analyses considered original item scales and second-order CSR factors. The data collection began with 1200 firms' managers, primarily focusing on professionals active in the field, reached through email and subsequent phone

TABLE 3 Exploratory factor analysis

	CSR	Digital technologies
Economic performance	0.812	
Environmental initiatives	0.810	
Social interactions	0.696	
Artificial intelligence		0.842
IoT sensors		0.752
Big data analytics		0.717
Intelligent transport systems		0.693
Cronbach's alpha	0.826	0.851

Figure 17: Data parameters Supplement 1 for Paper 9

TABLE 5 Results on H_2

	Green process innovation (H_{2a})	Energy efficient solutions (H_{2b})	Use of recycled material (H_{2c})	Green packaging (H_{2d})	Circular economy (H_{2e})	Safety risks (H_{2f})
CSR × moderator	0.575**	0.505*	0.643**	0.602**	0.468**	0.426**
Main effect of the moderator	*0. 069*	*0.075*	*0.051*	*−0.033*	*0.098*	*−0.077*
Results of H_2 and related t-test	*Supported with z-value = 3.994*	*Supported with z-value = 3.885*	*Supported with z-value = 8.374*	*Supported with z-value = 6. 095*	*Not supported with z-value = 0.126*	*Not supported with z-value = 1.222*

Note: Italic values are not significant.
*p-value < 0.05; **p-value < 0.01.

Figure 18: Data parameters Supplement 2 for Paper 9

contacts. Researchers obtained 157 usable responses, about 12% of the target population. A majority of these firms reported annual sales turnovers exceeding $100 million (52%) and had more than 200 employees (53%). The data primarily came from European (73%) and American (16%) companies, with supply chain managers (52%) representing manufacturing (3%) and retail (23%) sectors. Food and Beverage (22%) and Fashion & Apparel (12%) were the dominant industries. The sample description is given in the table.

9.5 Paper Link

Access the full paper at https://onlinelibrary.wiley.com/doi/full/10.1002/csr.2249.

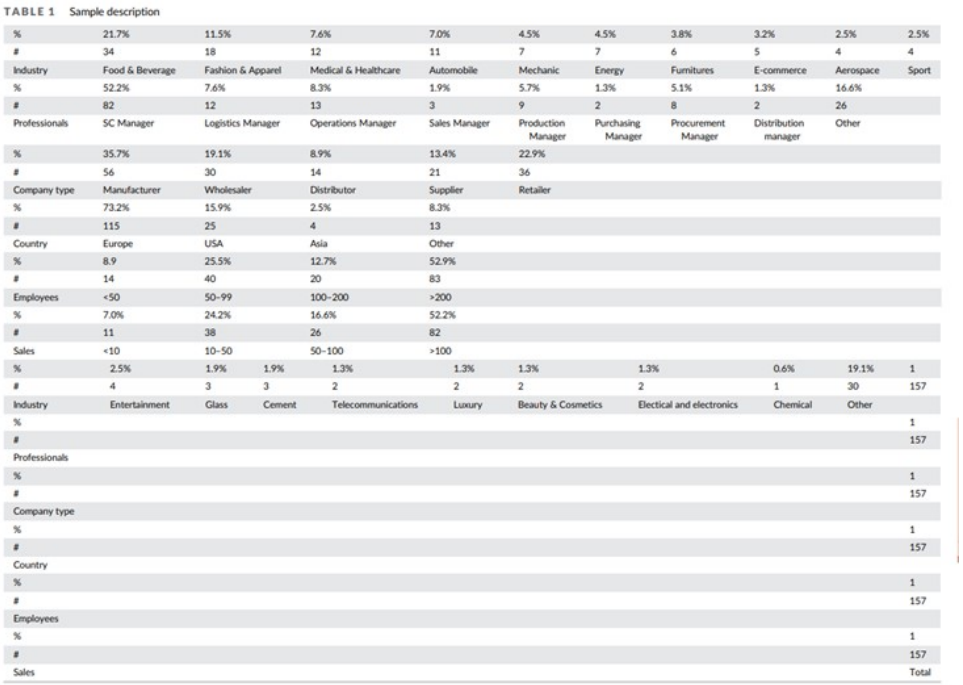


TABLE 1 Sample description

%	21.7%	11.5%	7.6%	7.0%	4.5%	4.5%	3.8%	3.2%	2.5%	2.5%
#	34	18	12	11	7	7	6	5	4	4
Industry	Food & Beverage	Fashion & Apparel	Medical & Healthcare	Automobile	Mechanic	Energy	Furnitures	E-commerce	Aerospace	Sport
%	52.2%	7.6%	8.3%	1.9%	5.7%	1.3%	5.1%	1.3%	16.6%	
#	82	12	13	3	9	2	8	2	26	
Professionals	SC Manager	Logistics Manager	Operations Manager	Sales Manager	Production Manager	Purchasing Manager	Procurement Manager	Distribution manager	Other	
%	35.7%	19.1%	8.9%	13.4%	22.9%					
#	56	30	14	21	36					
Company type	Manufacturer	Wholesaler	Distributor	Supplier	Retailer					
%	73.2%	15.9%	2.5%	8.3%						
#	115	25	4	13						
Country	Europe	USA	Asia	Other						
%	8.9	25.5%	12.7%	52.9%						
#	14	40	20	83						
Employees	<50	50–99	100–200	>200						
%	7.0%	24.2%	16.6%	52.2%						
#	11	38	26	82						
Sales	<10	10–50	50–100	>100						
%	2.5%	1.9%	1.9%	1.3%	1.3%	1.3%	1.3%	0.6%	19.1%	1
#	4	3	3	2	2	2	2	1	30	157
Industry	Entertainment	Glass	Cement	Telecommunications	Luxury	Beauty & Cosmetics	Electical and electronics	Chemical	Other	
%										1
#										157
Professionals										
%										1
#										157
Company type										
%										1
#										157
Country										
%										1
#										157
Employees										
%										1
#										157
Sales										Total

Figure 19: Datasets Supplement 1 for Paper 9

10 Paper 10: The Effect of Digital Marketing Adoption on SMEs Sustainable Growth: Empirical Evidence from Ghana.

Journal/Conference Rank: Q1
Publication Year: 2023
Reference: [10]

10.1 Summary

The rise of online presence is becoming a pivotal part of modern businesses, used to engage in competition and connect with consumers. This paper investigates the role of such platforms in how consumers can support sustainable or small/medium enterprise businesses. A structured questionnaire was used, and 533 SME owners/managers in Ghana participated in the survey. The findings indicate that attitudes toward digital technologies do not influence the intention to use it. However, perceived behavior control and subjective norms play a role in individuals' intentions to utilize such online platforms. Furthermore, a direct positive link between subjective norms and the actual use of digital marketing was observed. Importantly, there is a positive correlation between the actual use of online platforms and the sustainable growth of SMEs, affirming its significant role in supporting such businesses, especially in developing countries. This study hence contributes to the understanding of factors encouraging the adoption of such web applications in supporting sustainable and SME business growth.

10.2 Software Architecture

Refer to Software architecture diagram for Paper 10.

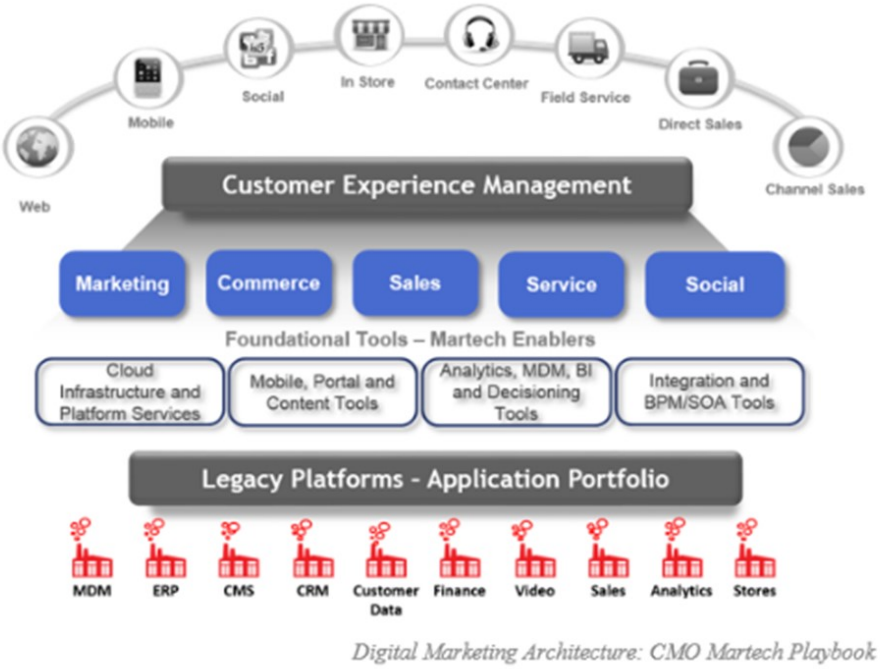


Figure 20: Software architecture diagram for Paper 10.

10.3 Data Parameters

The paper employs the theory of planned behavior as a conceptual framework. It involves the incorporation of several key data parameters, including attitudes toward digital marketing, perceived behavior control, subjective norms, intention to use online platforms, actual behavioral use of such platforms, and sustainable growth of sustainable/SME businesses.

The findings of this study (see tables) reveal that while individuals' attitudes toward digital marketing do not directly affect their intention to use digital marketing, perceived behavior control and subjective norms significantly influence individuals' intentions to embrace digital marketing practices. Furthermore, the study establishes a direct positive association between subjective norms and the actual behavioral adoption of digital marketing. Most notably, the research underscores a positive correlation between the actual use of digital marketing strategies and the sustainable growth of SMEs. This reaffirms that digital marketing plays a pivotal role in enhancing the sustainable growth of small and medium enterprises in developing economies

10.4 Datasets Used

The study adopted a cross-sectional research design and collected data from 533 respondents, including SME owners, managers, IT personnel, and other departmental representatives, who were selected using a simple random sampling technique (Table).

Table 2. Test of Validity and Reliability Research Constructs.

Constructs	Cronbach's Alpha	Jöreskog's Rho (ρc)	Composite Reliability	Average Variance Extracted (AVE)
Attitude	0.914	0.924	0.939	0.795
Intention to Use DM	0.953	0.954	0.966	0.877
Actual use of DM	0.841	0.843	0.904	0.759
Perceived Behavior Control	0.928	0.933	0.949	0.823
SMEs Sustainable Growth	0.954	0.954	0.966	0.878
Subjective Norm	0.945	0.947	0.960	0.858

Source: Field data (August–November 2022).

Figure 21: Data parameters Supplement 1 for Paper 10

Table 4. Discriminant Validity Fornell–Larcker Criterion.

Constructs	Attitude	Intention to Use DM	Actual Use of DM	Perceived Behaviour Control	SMEs Sustainable Growth	Subjective Norm
Attitude	0.892					
Intention to Use DM	0.556	0.937				
Actual Use of DM	0.617	0.839	0.871			
Perceived Behavior Control	0.719	0.682	0.721	0.907		
SMEs Sustainable Growth	0.546	0.709	0.878	0.622	0.937	
Subjective Norm	0.614	0.707	0.813	0.753	0.692	0.926

Source: processing from SmartPLS 3.3 software.

Figure 22: Data parameters Supplement 2 for Paper 10

To ensure representative coverage, diverse sectors within Ghana's SME landscape were included, such as manufacturing, restaurants, communication services, fashion, and more, all of which actively employ digital marketing strategies. The data collection process occurred over four months in 2022, and rigorous ethical standards were maintained by anonymizing responses. After data cleaning, the study employed Partial Least Squares-Structural Equation Modeling (PLS-SEM) to analyze the data, chosen for its capacity to handle complex models and flexibility in data requirements and measurements. This research contributes to understanding the role of online platforms in supporting the growth of sustainable/SME businesses in the Ghanaian context.

10.5 Paper Link

Access the full paper at https://www.mdpi.com/2071-1050/15/6/4760 .

Table 5. An estimate of the hypothesized structural path model significance.

Constructs	Beta	Sample Mean (M)	Standard Deviation	T Statistics	*p* Values	Test Outcome
Attitude -> Intention to Use DM	0.070	0.073	0.051	1.376	0.169	Not Agreed
Perceived Behavior Control -> Intention to Use DM	0.305	0.304	0.070	4.358	0.000	Agreed
Subjective Norm -> Intention to Use DM	0.434	0.433	0.074	5.902	0.000	Agreed
Intention to Use DM->Actual use of DM	0.529	0.533	0.038	13.962	0.000	Agreed
Subjective Norm ->Actual use of DM	0.439	0.435	0.043	10.144	0.000	Agreed
Actual use of DM-> SMEs Sustainable Growth	0.878	0.880	0.015	58.043	0.000	Agreed
	R Square		**R Square Adjusted**			
Intention to Use DM	0.554		0.551			
Actual use DM	0.801		0.800			
SMEs Sustainable Growth	0.771		0.771			

Source: processing from SmartPLS 3.3 software.

Figure 23: Data parameters Supplement 3 for Paper 10

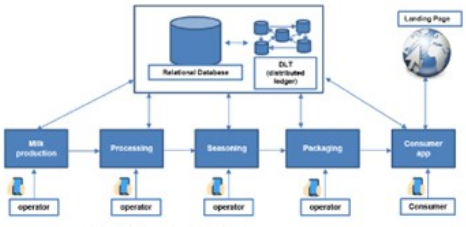


Figure 24: Datasets Supplement 1 for Paper 10

11 Paper 11: How can artificial intelligence impact sustainability: A systematic literature review?

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [11]

11.1 Summary

The paper focuses on the intersection of artificial intelligence (AI) and sustainability. It emphasizes the need for effective mechanisms to address environmental, economic, and societal issues while advancing sustainability. Researchers have explored the application of AI and machine learning to promote a circular economy and meet the present generation's needs without compromising future generations.

Key points

1. Comprehensive Review: The article provides a comprehensive review of the relationship between AI and sustainability, highlighting its relevance in various industries such as construction, transportation, healthcare, manufacturing, agriculture, and water. 2. Research Scope: Potential areas for future research in AI and sustainability is highlighted, offering insights into the promising directions in this field.

3. AI Techniques: Various AI techniques used in sustainability, with an emphasis on RL (Reinforcement Learning) and DSS-based AI models, which have gained popularity in the context of sustainability are pointed out. It highlights the importance of AI in reducing emissions and improving energy efficiency with aided government policies.
4. Industrial Sectors: The review categorizes industrial sectors based on the methods they employ to incorporate sustainable development practices into their operations.

Uses of AI
AI is used in sustainability for addressing energy emissions and CO2 reduction, monitoring deforestation, efficient supply chain management, in-depth monitoring and control in manufacturing industries, contributing to economic, social, and environmental aspects, predicting consumer purchasing trends, optimizing supply chain management and resource allocation, and application in healthcare for achieving climate-focused Sustainable Development Goals (SDGs).

11.2 Software Architecture

The research methodology is employed for a systematic review on the intersection of artificial intelligence (AI) and sustainability followed by the Preferred Reporting Items and Meta-Analyses (PRISMA) methodology. A comprehensive search was conducted in the Scopus database using specific keywords related to AI and sustainability. The research involved iterative screening, analysis, and coding of articles to identify key themes and contributions in the context of AI and sustainability. PRISMA provides a checklist and flow diagram to guide researchers through the review process, making it more transparent, rigorous, and reliable. This method is widely used in various fields for evidence-based decision-making.
The study delves into the AI learning methods preferred by researchers and the associated algorithms based on 287 journals. Supervised learning is the most popular approach, with 52% of the papers using it, while 22% employ unsupervised learning. Reinforcement was least used. The dominant AI algorithms in sustainability research include regression (54%), reinforcement learning (45%), and Decision Support System (DSS) (36%). These methods help address sustainable data sources and carbon footprint issues. Other algorithms such as random forest, Artificial Neural Network (ANN), and Convolutional Neural Network (CNN) are also utilized. However, less common methodologies include path models, game theory, and genetic algorithms.

11.3 Data Parameters

The data parameters are the types of AI learning approaches and algorithms employed in sustainability research.
1) AI Learning Approaches: Analyzes the usage of supervised, unsupervised, and reinforcement learning.
2) AI Algorithms: Identifies specific algorithms (e.g., regression, DSS, Random Forest, ANN, CNN) and their prevalence in sustainability studies.
3) Industrial Sectors: Categorizes sectors applying AI for sustainability, offering insights into domain-specific AI trends.

11.4 Datasets Used

The used data set in this review consists of 287 papers obtained from 21 different journals, reflecting a wide variety of sources and multidisciplinary nature. These papers collectively form the data set underlining the comprehensive and multidisciplinary nature of the data sources harnessed for this study.

11.5 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/abs/pii/S0959652622036927?via

12 Paper 12: Digitalization and new technologies for sustainable business models at the ship–port interface: a bibliometric analysis

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: [12]

12.1 Summary

The paper explores the capacity of digitalization and new technologies to support sustainable and innovative development in the shipping and seaport industry, aligning with the United Nations' 2030 Agenda for Sustainable Development Goals (SDGs) .The study conducts a systematic literature review and bibliometric analysis of 132 English language publications between 1969 and 2020 .The findings indicate that the literature has primarily focused on the environmental externalities associated with ship-port operations. The paper highlights the importance of integrating sustainability into corporate strategy through digitalization and new technologies to drive responsible and resilient choices at the ship-port interface. It emphasizes that corporate choices that prioritize ecosystem protection can improve corporate performance and reputation, aligning with the goals of reducing atmospheric emissions. The study contributes to the understanding of key variables that play a role in achieving the SDGs in the shipping and seaport industry. Overall, digitalization fosters sustainability and resilience in the maritime and port sector by optimizing processes and predicting costs.

12.2 Software Architecture

The study uses a quantitative methodology to examine articles related to EESssBM (Environmental, Economic, and Social Sustainable Shipping and Seaport Business Models), digitalization, new technologies, and performance. The researchers collected sample papers from databases like Web of Science and Scopus. They selected articles from well-known journals focusing on these topics. Each selected article underwent content analysis, and the researchers checked for consistency with the research questions. The final list of 132 sample articles was used for network analysis using VOSviewer software. The search procedure was divided into two phases: searching for relevant articles and conducting bibliometric analysis. The search for relevant articles involved multiple combinations of

search strings, ensuring comprehensive coverage of the subject. The final phase included critical review and resulted in the 132 selected articles.

12.3 Data Parameters

The paper focuses on a bibliometric analysis of 132 English language publications between 1969 and 2020. The research examined publication trends in the shipping and port interface. It considered factors like publication numbers by year, journals, countries, institutions, and authors' contributions. Data for this analysis was gathered from Scopus and ISI Web of Science databases.

12.4 Datasets Used

Raw data sets of - document type, source type, year of publication, active source titles, country and institution contribution, authorship and coauthor ship are intensively analyzed. These data are then visualized using VOSviewer. Some of the data sets are provided below.

12.5 Paper Link

Access the full paper at https://www.tandfonline.com/doi/citedby/10.1080/03088839.2021.1903600?scr

13 Paper 13: A Review of Blockchain Technology Adoption in the Tourism Industry from a Sustainability Perspective

Journal/Conference Rank: Q1
Publication Year: 2023
Reference: [13]

13.1 Summary

Blockchain technology for securely storing transaction and service data is highlighted on and Blockchain's use in the tourism sector, with a focus on sustainability. Using the Web of Science database and bibliometric analysis, the study evaluates the extent of research in this area. Despite the growing academic interest in Blockchain, its potential to enhance sustainability in tourism is underexplored. The paper advocates using open-source software for bibliometric analysis to identify trends in Blockchain's impact on tourism sustainability.

13.2 Software Architecture

The research used the Web of Science (WoS) scientific database for retrieving documents and conducting the analysis. Additionally,the research mentions the use of two specific software tools:
1. Bibliometix: This is an open-source application that assists in thematic mapping and exploring the evolution of academic research fields. It's used for bibliometric analysis,

particularly for creating bibliometric maps and exploring related terms.
2. VOSViewer: Another software tool mentioned is VOSViewer, which is used for bibliometric map analysis. It is developed for text mining and allows for the formation of clusters or themes related to academic research based on keywords, authors, and publications.

13.3 Data Parameters

The data parameters used in the research refer to the criteria and methods used to analyse the data set. This included systematic review, descriptive bibliometric analysis, and network analysis based on co-authorship, co-citation, and keyword analysis. These parameters helped in identifying research trends, authorship patterns, and the impact of Blockchain technology on the tourism sector.

13.4 Datasets Used

The data set used in the research refers to the collection of documents and resources that were analysed. It consisted of 96 documents published in various journals and books related to the topic of applying Blockchain technology in the tourism industry. These data are then visualized using VOSviewer. Some of the data sets are provided below.

13.5 Paper Link

Access the full paper at https://www.mdpi.com/0718-1876/18/2/42.

14 Paper 14: Green procurement process model based on blockchain–IoT integrated architecture for a sustainable business.

Journal/Conference Rank: Q1
Publication Year: 2020
Reference: [14]

14.1 Summary

The paper focuses on the use of blockchain and IoT technologies for green procurement activities in the supply chain. It addresses the challenges faced by industries in implementing green procurement and aims to provide solutions through the integration of blockchain and IoT. The research considers all aspects of green procurement, including vendor selection, logistics, and end-of-life product management while emphasizing on the importance of green initiatives for global competitiveness and recognition, as well as the minimal usage of energy and efficient waste disposal.

14.2 Software Architecture

The paper proposes a blockchain-IoT integrated architecture for green procurement activities in the supply chain. The architecture is developed based on the analysis of blockchain

and IoT elements to overcome the challenges faced by industries in green procurement. It addresses all aspects of green procurement, including vendor selection, reverse logistics, and end-of-life product management. The architecture aims to transform the green supply chain by incorporating blockchain and IoT technologies. It provides a framework for industries planning to implement blockchain and IoT in their supply chains to solve green procurement challenges. The architecture enables better planning of resources and identification of areas to focus on for successful implementation of smart technologies in the supply chain. It ensures minimal energy usage, efficient waste disposal, and contributes to global competitiveness and recognition.

14.3 Data Parameters

The paper employs the TISM (Total Interpretive Structural Modeling) methodology to analyze barriers in green procurement. It uses a reachability matrix and level partitioning. Key steps:
1. Interpreting Relationships: Comparative study of barriers to understand their influence.
2. Reachability Matrix: "Y" becomes 1, "N" becomes 0. Checked for transitivity.
3. Level Partitions: Determines placement of elements based on reachability and antecedent sets.
4. TISM-based Model: Represents relationships between barriers visually.
5. MICMAC Analysis: Categorizes barriers into four clusters based on driving power and dependence.

14.4 Datasets Used

1)Finalreachability matrix ofI SM, 2) Level Partioning, 3) MICMAC analysis of barriers

14.5 Paper Link

Access the full paper at https://www.emerald.com/insight/content/doi/10.1108/MEQ-06-2019-0136/full/html.

15 Paper 15: Analysis of artificial intelligence-based technologies and approaches on sustainable entrepreneurship

Journal/Conference Rank: Q1
Publication Year: 2023
Reference: [15]

15.1 Summary

There is a growing proposition to utilize AI algorithms and models to promote sustainable development goals. This study aims to illuminate the crucial role of AI in advancing sustainable development. To achieve this, data from Scopus spanning 1994 to 2022 were collected, comprising 482 research articles. The investigation identifies key research

trends and employs visual mapping to propose new research directions. The findings indicate a positive correlation between AI and environmental development in the context of sustainable entrepreneurship.

15.2 Software Architecture

The research used a systematic review method guided by PRISMA as well to thoroughly investigate the impact of artificial intelligence and machine learning on long-term development. Articles published in English from 1994 to 2022 were collected from the Scopus database using a specific search query, ensuring the selection and evaluation of relevant research materials for the study.

15.3 Data Parameters

The data parameters include the analysis of keywords and their distribution, as well as the distribution of researchers according to countries. The analysis of keywords helps identify the primary topics and trends in the field of AI-based sustainable entrepreneurship. The distribution of researchers according to countries provides insights into which countries have the highest frequency of published articles in this field.

15.4 Datasets Used

The following are the most significant keywords:
• artificial intelligence (98) • sustainability (59) • sustainable development (29) • industry 4 0 (27) • big data (24) • machine learning (20) • decision support systems (19) • decision support system (17) • circular economy (16) • IoT (15) • digital transformation (13) . The data set of author citation is also included.

15.5 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/abs/pii/S0040162522006734?via

16 Paper 16: Analyzing the Concept of Corporate Sustainability in the Context of Sustainable Business Development in the Mining Sector with Elements of Circular Economy

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [16]

16.1 Summary

The article discusses how companies, especially in the mining sector, can become more environmentally and socially responsible to achieve sustainable development. It emphasizes that there's no one-size-fits-all definition for corporate sustainability. By using the

example of Russia's mining industry, it illustrates the impact of mining on the environment, economy, and society. The article suggests that mining companies need to manage their environmental and social impact to be sustainable and support sustainable development. It also highlights the importance of adopting circular economy practices for sustainability. Overall, the main idea is to encourage companies, especially in mining, to embrace sustainability for a better future.

16.2 Software Architecture

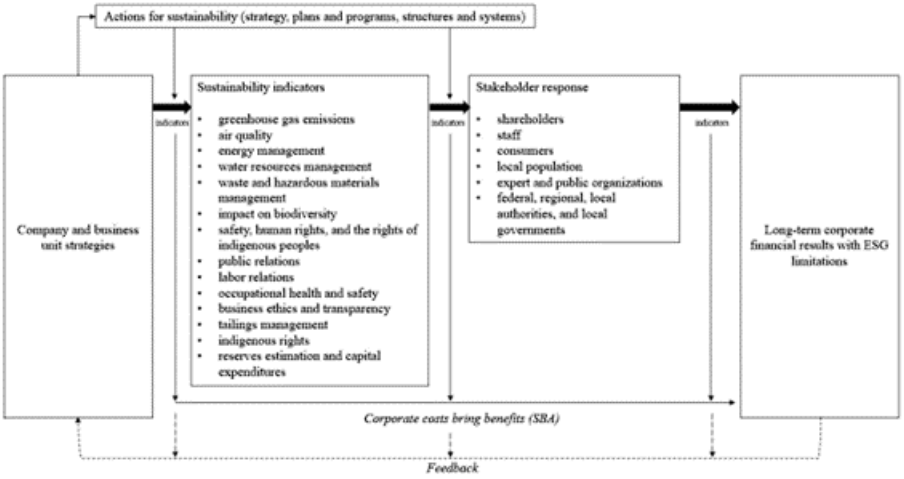


Figure 25: Software architecture diagram for Paper 16.

The study utilizes a methodology comprising case studies, systems-oriented analysis, decomposition, and comparative analysis. Extensive source analysis and a literature review involving five interrelated aspects were conducted (represented by boxes 1–5 in Figure 2) to comprehensively examine the topic and derive the required results (box 6).

16.3 Data Parameters

Conceptual Frameworks and Concepts: Various conceptual frameworks and concepts related to corporate sustainability, stakeholder engagement, circular economy, and sustainable development.

Mining Industry Specifics: Features and characteristics specific to the mining industry that are relevant to assessing corporate sustainability.

Environmental, Social, and Governance (ESG) Factors: Factors related to environmental, social, and governance considerations in the context of sustainability, particularly in the mining industry.

Circular Economy and Circular Business Models: The integration of circular economy principles and circular business models to enhance corporate sustainability, with a focus on waste reduction, circular supply chains, and energy decarbonization.

Integration into Corporate Strategies: Strategies and approaches for integrating sustainability and circularity into corporate strategies for mining companies.

Regulations and External Factors: Mention of industry-related regulations, environmental risks, socioeconomic impacts, and the influence of regulators on sustainability initiatives in the mining sector.

Interactions between Concepts: Understanding the relationships and interactions between concepts such as sustainability, circular economy, sustainable development, and their alignment at the micro level.

16.4 Datasets Used

Emissions of Harmful Substances (2009-2016): Harmful substance emissions increased by 12Greenhouse gas emissions increased: CO2 by 13.7C2F6 emissions from aluminum production decreased by 11.3

Land Usage and Reclamation (2009-2016): Total disturbed land area grew by 154Total reclaimed land area decreased by 42

Waste Generation (2016-2019): Waste from ore extraction increased by 70Waste from metal production increased by 18.5

Mineral Production (2009-2016): Iron ore production grew by 3.8Chromium ore production grew by 32.5Iron ore raw material production increased by 23.8

This data collection highlights significant changes in emissions, land use, waste generation, and mineral production within the Russian mining and metallurgy sectors during the mentioned time frames. It also anticipates a potential decrease in greenhouse gas emissions in the coming years.

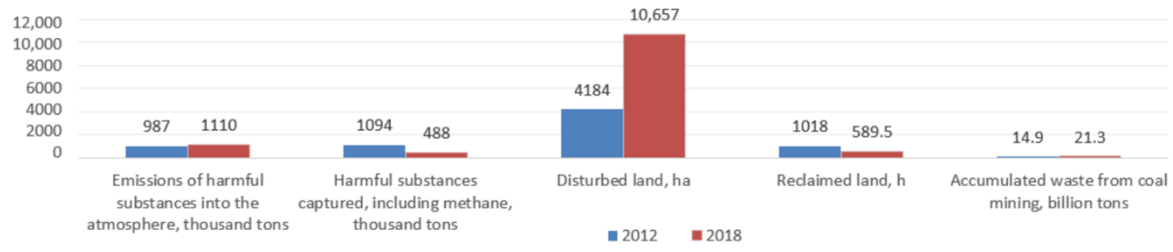


Figure 26: Datasets Supplement 1 for Paper 16

16.5 Paper Link

Access the full paper at https://www.mdpi.com/2071-1050/14/13/8163.

17 Paper 17: Redefining business models for the energy transition: Social innovation and sustainable value creation in the European energy system

Journal/Conference Rank: Q1
Publication Year: 2023
Reference: [17]

17.1 Summary

The paper talks about how the way we produce and use energy is changing in Europe. New technologies and rules let regular people, local groups, and local governments be

a part of the energy system in new and creative ways. This shift and the different actions people take related to energy are called "social innovation in energy systems. "This new approach not only helps make clean energy but also brings benefits to society that traditional energy ways might miss. The paper looks at these innovative actions using a "sustainability-oriented business model" framework. It studies what these actions aim for, who is involved, and how they create value.The paper looks at examples from different parts of Europe, studying what these new ways of handling energy mean and how they differ. It also thinks about how the history and existing systems influence these differences.

17.2 Software Architecture

Data Collection and Gathering Information: Information on SI networks in the energy system was collected from Groningen (Netherlands) and Riga (Latvia). Primary data was obtained through semi-structured online interviews and email communications. Secondary data was gathered from online reports, organization websites, and publications.

Stakeholder Identification and Interviews: Semi-structured interviews were conducted between May and November 2022, focusing on project visions, stakeholder roles, values, and network building. Stakeholders were identified using a snowball approach and summarized in Table 2.

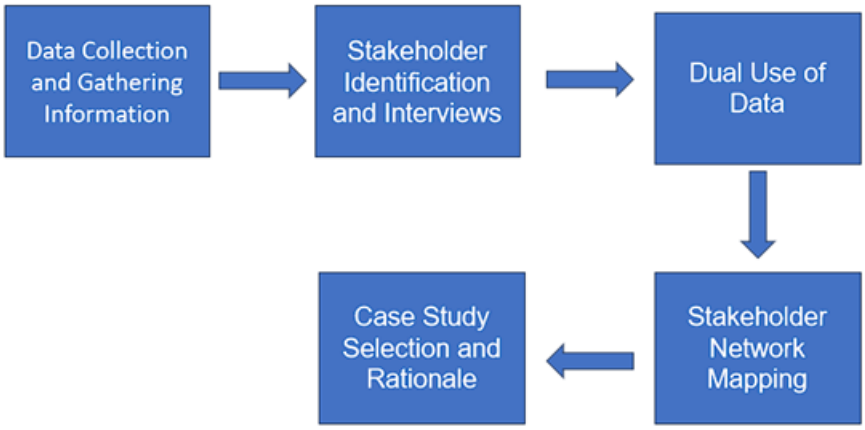


Figure 27: Software architecture diagram for Paper 17.

Dual Use of Data: Interviews provided insights into the energy and SI landscape, stakeholders involved, and their relationships in pursuing energy-related goals. Relationships between stakeholders were mapped into a stakeholder network to understand collaboration dynamics and goal achievements.

Stakeholder Network Mapping: Stakeholder relationships were mapped to construct a stakeholder network, emphasizing collaboration and achievement of shared goals. The networks exemplify various actors and relationships involved.

Case Study Selection and Rationale: The selection of two diverse case studies, Groningen (Netherlands) and Riga (Latvia), was based on a variation in a particular variable to enrich the research. Groningen was identified as an SI exhibit due to the Horizon2020 EC2 project focused on energy citizenship.

17.3 Data Parameters

Geography: Location: Groningen, Netherlands Location: Riga and surrounding areas, Latvia

Energy-related Goals: Netherlands' GHG emission reduction target of 49% less compared to 1990 levels by 2030 Renewable sources to produce 50% of energy by 2030 Groningen to be climate-neutral by 2035 GHG emission reduction target of 65% less compared to 1990 levels by 2030 Renewable sources to produce 50% of energy by 2030 Riga to be climate-neutral by 2050

Building Characteristics: In Groningen: 58% of people rent their homes 60% of homes are non-detached In Riga and surrounding areas: 70% of people live in multi-family homes and are owners

Market History and Ownership of Energy Infrastructure: In Groningen: State-owned transmission system operator (TSO) Number of distribution system operators (DSOs) In Riga and surrounding areas: State-owned transmission system operator (TSO) Number of distribution system operators (DSOs)

Heating Sources and Systems: In Groningen: Heating from a mix of district heating, gas, and heat pumps In Riga and surrounding areas: Heating for multi-story homes largely from district heating systems powered by a mix of wood chips and gas

17.4 Datasets Used

A collection or description of energy-related goals, building characteristics, market history, and other aspects related to the cities of Groningen (Netherlands) and Riga (Latvia). Datasets typically refer to structured collections of data, often in digital format, that can be analysed.

17.5 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S2214629623001743.

18 Paper 18: Sustainable business model innovation: Scale development, validation and proof of performance

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [18]

18.1 Summary

This study noticed that even though Sustainable Business Model Innovation (SBMI) is getting a lot of attention from both scholars and businesses, there isn't a reliable way to measure it. So, the researchers decided to create a measurement scale for SBMI. They started by talking to 20 people to understand things better (qualitative inquiry), and then they asked questions to 130 and 200 small and medium-sized businesses in Saudi Arabia (quantitative validation). From this, they made a scale with 10 questions that focus on

three parts of SBMI: making sure value is created and delivered sustainably, capturing value sustainably, and figuring out the right balance of sustainable value. This study found that using SBMI can make these businesses better and give them an edge over others. This is a big deal for small and medium-sized businesses, and it gives business owners and managers a useful tool.

18.2 Software Architecture

The methodology outlined in the Figure involves three key steps. First, in "Step 1: Item Generation," items for the research scale are generated by interviewing 20 respondents with varying education levels and ages. These interviews result in the creation of 12 items distributed across three dimensions of Sustainable Business Model Innovation (SBMI). Second, in "Step 2: Content Validity," an independent panel of experts assesses the items for face and content validity, ensuring they adequately represent the intended constructs. Finally, in "Step 3: Exploratory Factor Analysis," statistical techniques, such as Exploratory Factor Analysis, are likely applied to uncover the underlying structure and relationships of the constructs, though specific details are not provided.

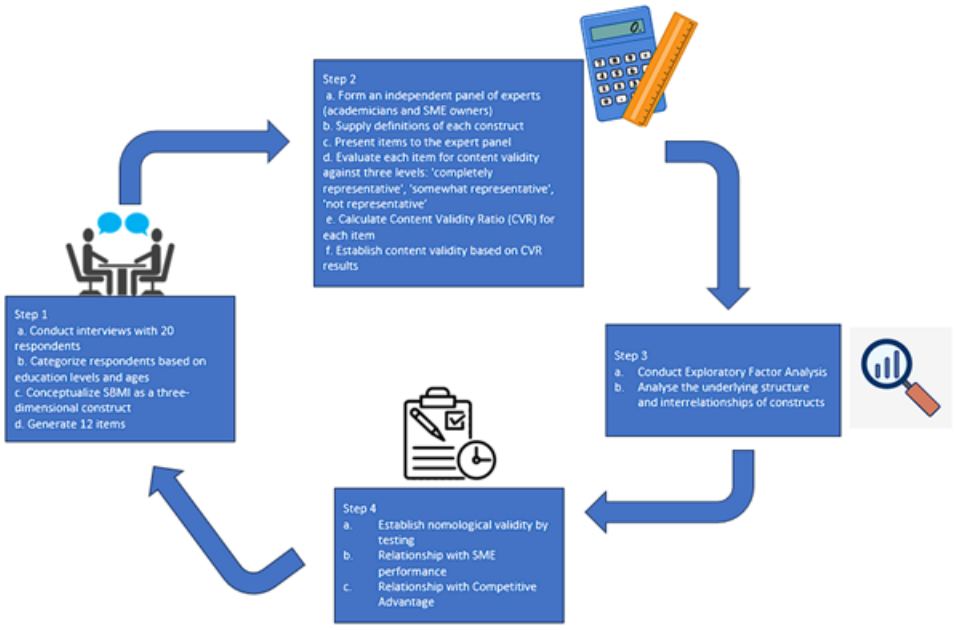


Figure 28: Software architecture diagram for Paper 18.

18.3 Data Parameters

Population: SMEs (Small and Medium-sized Enterprises)

Data Collection: Around 600 questionnaires were distributed to SMEs.220 completed questionnaires were received back.

Data Cleaning: 20 responses were deleted due to missing information.

Final Analyzed Data: 200 responses were used for analysis after data cleaning.

Response Rate: The response rate was 28.5%.

Management Representation: 40% of the sample represented respondents from top management. 60% of the sample represented respondents from middle management, particularly those responsible for setting their company's strategic orientation.

Industry Representation: 64.5% of the sample consisted of SMEs from the manufacturing industries. 35.% of the sample represented service organizations.

Employee Size Distribution: 47% of the firms employed up to 50 people. 19% employed between 51-100 people. 15% employed between 101-150 people. 10% employed between 151-200 people. 9% employed between 200-249 people.

Age Distribution of SMEs: 65% of the SMEs were up to 10 years old. 18% were 11-20 years old. 9% were 21-30 years old. 8% were 31-40 years old.

Market Orientation: 90% of the SMEs selected had a local market orientation.

Ownership: 93% of SMEs had private ownership.

18.4 Datasets Used

Dataset for Scale Development: This dataset was used for item generation and mapping with similar constructs from literature, qualitative insights, and in-depth interviews with SME owners and faculty members.

Dataset for EFA, CFA, and Nomological Validity Assessment: A second dataset of 200 SMEs was used for exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and nomological validity assessment to validate the scale and test the factor structure.

18.5 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S2444569X22000798.

19 Paper 19: Transition toward green economy: Technological Innovation's role in the fashion industry

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [19]

19.1 Summary

The abstract highlights the growing concern about unsustainable fashion consumption and wasteful practices, particularly emphasizing the importance of sustainability in the fashion industry. The global fashion industry is projected to experience substantial growth, underscoring the necessity for addressing its environmental impact. Technological advancements are identified as crucial for transitioning towards a green economy and fostering an environmentally conscious fashion movement. Despite initial skepticism, technology plays a vital role in achieving sustainability in an industry known for its waste generation. Sustainable fashion technologies offer effective waste reduction strategies encompassing materials, products, and consumer experiences. The abstract also emphasizes the positive impact of material changes by environmentally conscious businesses, leading to improved longevity of fashion products and reduced resource consumption. Lastly, it

suggests a proposed model that can guide fashion startup managers in leveraging technological innovations to achieve successful sustainability in the fashion industry.

19.2 Software Architecture

This figure illustrates the necessity of innovation at various levels to reduce environmental impacts in the textile industry and facilitate a transition towards a green economy. The figure emphasizes the importance of technical and product-centric eco-design strategies, showcasing the need for collaboration among different stakeholders such as governments, businesses, and citizens. These collaborative efforts, supported by technical and policy solutions, are critical in enabling a sustainable shift within the fashion industry. The diagram conveys that understanding the environmental implications of textile production and fostering a green economy necessitate acknowledging the entire lifecycle of products and services, promoting sustainable design, and encouraging conscious consumption.

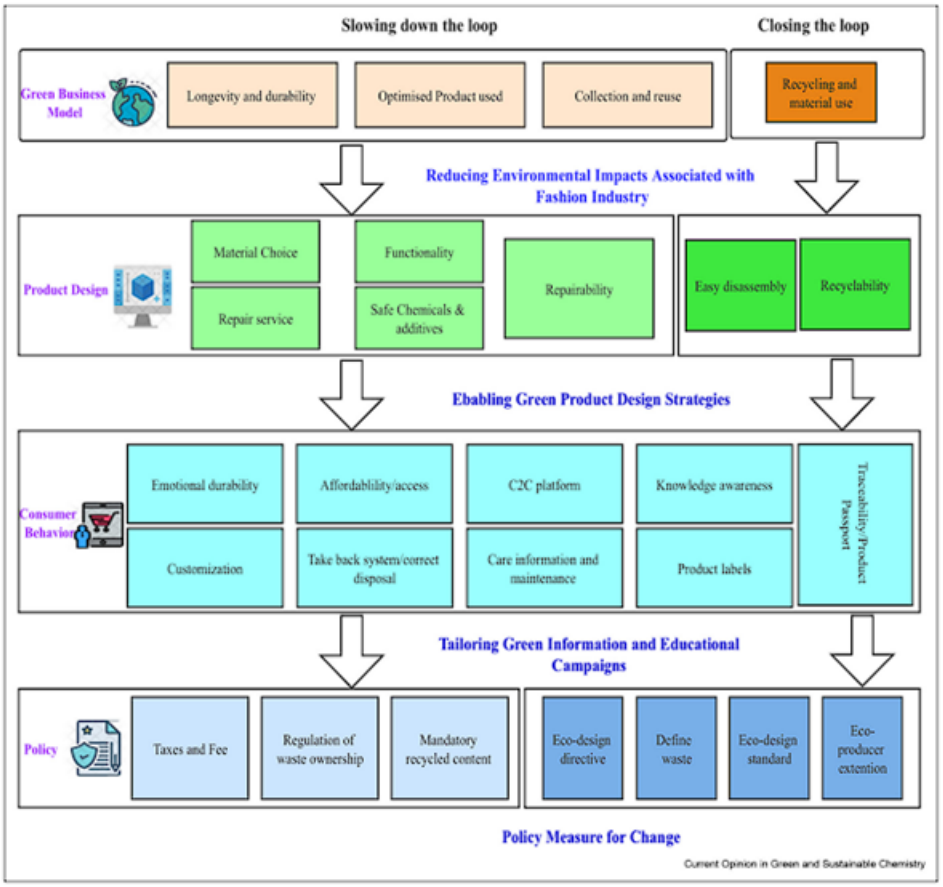


Figure 29: Software architecture diagram for Paper 19.

19.3 Data Parameters

Economic and Employment Impact of Fashion Industry: The fashion industry is a significant part of the global economy, valued at over $1.5 trillion and employing more than 75 million people.

Environmental Impact and Consumption Trends: Clothing production has doubled over the last decade, contributing to 10% of human CO2 emissions and polluting water

sources. In 2022, 25% more clothes were bought compared to 2019, with 98% of them being used for only half as long. Environmental impacts include textile waste in dumps, microplastic pollution from washing clothes, and high polyester usage.

Material Composition and Environmental Harm: Approximately 60% of garments are made of non-decomposable polyester, which releases significant CO2 and contributes to environmental pollution. Non-organic cotton production involves the use of toxic chemicals, contributing to environmental and social damage.

Efforts Towards Sustainability: Upcycling, downcycling, and reusing textile fibres are emerging practices to reduce waste and enhance sustainability in the fashion industry. Sustainable initiatives include recycling programs, transparent supply chains, eco-friendly packaging, and responsible sourcing of raw materials.

Water and Energy Consumption: The fashion industry is the second most water-intensive industry, consuming approximately 79 billion cubic meters of water annually. Clothing production requires substantial thermal and electrical energy, contributing to pollution.

Challenges and Solutions: Fast fashion, while popular, poses sustainability challenges, emphasizing the need for eco-friendly practices and supply chain transparency. Circular fashion and a green economy can mitigate the industry's carbon footprint by adopting sustainable practices and eliminating fossil fuel-based models.

Sustainable Transition and Eco-Friendly Practices: Encourages technical eco-design, collaboration, and international management standard schemes to improve sustainability performance in the fashion industry. Highlights the importance of consumer education and behavior change in promoting sustainable fashion.

19.4 Datasets Used

Economic value of the fashion industry ($1.5 trillion, 2020). Employment in the fashion industry (over 75 million people). Clothing production trends and growth. Environmental impacts (carbon dioxide emissions, water pollution, waste generation). Textile composition (polyester, non-organic cotton). Sustainability initiatives (upcycling, recycling, responsible sourcing). Water and energy consumption in the fashion industry. Challenges in fast fashion and sustainability solutions. Circular fashion and its potential benefits. Technical eco-design and collaboration in the fashion industry. International management standard schemes for sustainability in fashion

19.5 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/abs/pii/S2452223622000694.

20 Paper 20: An Internet of Things Embedded Sustainable Supply Chain Management of B2B E-Commerce

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [20]

20.1 Summary

This research paper focuses on using modern technologies like the Internet of Things (IoT) to make the supply chain of textile items more eco-friendly and efficient. They created a smart plan using advanced math to reduce the costs and environmental impact, considering things like packaging, transport, and carbon emissions. They also looked at the cost of adding special devices to vehicles. They tested this plan in different situations and found it could be very useful for organizing the movement of products and designing the supply chain in a smart way.

20.2 Software Architecture

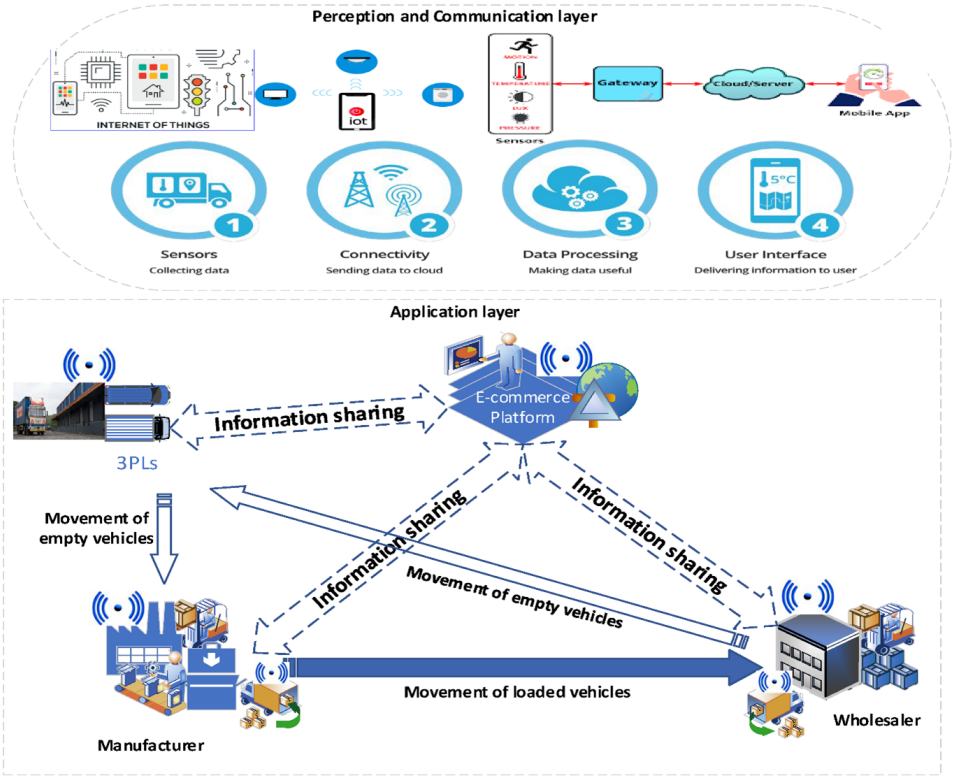


Figure 30: Software architecture diagram for Paper 20.

This study focuses on enhancing supply chain sustainability in B2B e-commerce within the textile industry by incorporating IoT technology. The framework, illustrated in Figure 1 addresses B2B order packaging, transportation, environmental concerns, and IoT implementation in transport vehicles to optimize the supply chain. An optimization model considers costs like order packaging, handling, transportation, carbon emissions, RFID tag purchasing, and IoT facilities. It aids in route optimization for order pickup and delivery, emphasizing the best pickup points and optimal allocation of transport vehicles to minimize overall supply chain costs.

20.3 Data Parameters

First Case Scenario:

Demand:

Decreased by 25%: 5,181,534; Decreased by 50%: 3,465,217; Increased by 25%: 8,071,543; Increased by 50%: 9,940,140

Cost-Related Parameters:

Decreased by 25%: 5,244,707; Decreased by 50%: 3,396,059; Increased by 25%: 7,945,861; Increased by 50%: 9,859,677

Purchasing Costs Related to IoT Facilities and RFID Tags:

Decreased by 25%: 5,371,053; Decreased by 50%: 3,624,813; Increased by 25%: 7,869,388; Increased by 50%: 9,733,996

Fifth Case Scenario:

Demand:

Decreased by 25%: 31,041,636; Decreased by 50%: 21,158,186; Increased by 25%: 48,033,567; Increased by 50%: 57,544,488

Cost-Related Parameters:
Decreased by 25%: 30,604,483; Decreased by 50%: 19,622,450; Increased by 25%: 47,284,706; Increased by 50%: 56,966,686

Purchasing Costs Related to IoT Facilities and RFID Tags:

Decreased by 25%: 30,277,569; Decreased by 50%: 20,272,476; Increased by 25%: 47,094,640; Increased by 50%: 57,913,216

These parameters represent variations in demand and cost-related factors for the first and fifth case scenarios, with both decreases and increases in percentages.

20.4 Datasets Used

Data sets that were used in this research includes, demand, cost-related parameters, and purchasing costs related to IoT facilities and RFID tags under various scenarios. For example, in the "First Case Scenario," the data set for demand includes values such as 5,181,534 (for a 25% decrease), 3,465,217 (for a 50% decrease), 8,071,543 (for a 25% increase), and 9,940,140 (for a 50% increase). Similarly, there are corresponding data sets for cost-related parameters and purchasing costs related to IoT facilities and RFID tags for the different scenarios and percentage changes.

20.5 Paper Link

Access the full paper at https://www.mdpi.com/2071-1050/14/9/5066.

21 Paper 21: Technological Revolution and Circular Economy Practices: A Mechanism of Green Economy

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [21]

21.1 Summary

This paper shows the relation between sustainability and technology in the Eastern European automotive industry. The focus is on transitioning to Circular Economy (CE) practices, which is a way for minimizing waste material, and how Industry 4.0 technologies like blockchain, IoT and business analytics can aid in it. The significance of adopting sustainable business operations through technology is presented here. It illustrates how technologies can transform the traditional practices and promote resource efficiency. This paper employs a digital survey methodology for data collection from manufacturing firms in Ukraine, Poland, and Romania. It utilizes Structural Equation Modeling (SEM) for data analysis and hypothesis testing. Furthermore, this paper recognizes the multifaceted impact of CE practices, both on environmental conservation and economic practices.

21.2 Software Architecture

By interacting through Industry 4.0 technology interfaces user would be able to access necessary features for CE practices.

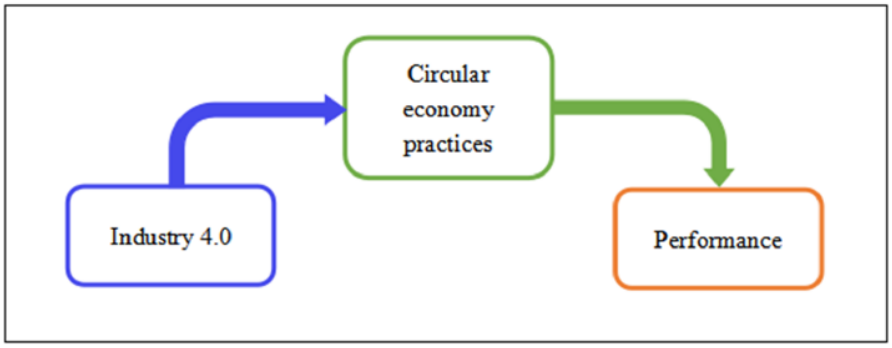


Figure 31: Software architecture diagram for Paper 21.

21.3 Data Parameters

Digital surveys have been used as the primary data collection tool for this research. The respondents were from manufacturing firms located in Eastern Europe countries like Ukraine, Poland and Romania. Through a convenient sampling approach, the study distributed 400 questionnaires through various communication channels like WhatsApp, LinkedIn, Telegram and Emails to various firms operating in automotive sector.

21.4 Datasets Used

A total of 400 questionnaires were sent to different firms from where 229 responded and 16 of those were discarded for irrelevancy to the research, In total 213 responses were used in analysis for the testing of hypotheses, which reflect the response rate of 53.25

21.5 Paper Link

Access the full paper at https://www.mdpi.com/2071-1050/14/8/4524.

22 Paper 22: Adopting artificial intelligence in sustainable business

Journal/Conference Rank: Q1
Publication Year: 2023
Reference: [22]

22.1 Summary

This paper dives into the extensive usage of Artificial Intelligence (AI) in different business sectors to drive sustainability within businesses, with a specific focus on social, ecological, and societal dimensions. It presents how AI technology is effectively employed to enhance employee safety, optimize energy consumption, and assess environmental impacts in businesses that focus on sustainability primarily. This study emphasizes the remarkable potential of AI-powered tools in offering users comprehensive insights into sustainable businesses. The study highlights AI's growing importance in Finland and reveals that its deployment is primarily motivated by optimization and the pursuit of benefits across different dimensions of sustainable business

22.2 Software Architecture

AI adaptation for collecting various data where the data would be processed and searchable using keywords related to sustainability.

22.3 Data Parameters

The data parameters for this research involved accomplishing an explorative archival study in the spring of 2022. To construct the studies sample, the study applied Talouselämä's TE500 list, which ranks the 500 largest organizations in Finland. These companies had been selected based totally on the largest gross investments made in 2020. Data were amassed from the five brand new annual reviews or monetary statements for every of the 25 selected Finnish corporations. This approach aimed to make certain the variety and representativeness of the information, masking a variety of industries and era adoption. The data had been derived from publicly to be had assets, which include annual organization reports and economic statements, aligning with the studies' recognition on exploring AI adoption in sustainable businesses without the want for direct contact with the businesses.

22.4 Datasets Used

Table 1
Enterprises with the largest gross investments from TE500 listings for 2020 (https://www.talouselama.fi/te500).

POS.	ENTERPRISE	INDUSTRY	GROSS INVESTMENTS/M€	REVENUE/ M€
1.	A	Energy	4941	49015
2.	B	Oil Refining	1197	11751
3.	C	Forestry	903	8580
4.	D	Forestry	687	8553
5.	E	Energy	573	190
6.	F	Technology & Services	545	3740
7.	G	Air Traffic	515.9	829
8.	H	Media	504.5	1062
9.	I	Communications	479	21817
10.	J	Forestry	400.5	5055
11.	K	Wholesale & Retail	398.4	10669
12.	L	Real Estate	371.2	384
13.	M	Communications	336	1895
14.	N	Communications	323.5	929
15.	O	Rental Apartments	305.5	434
16.	P	Consumer Packaging	262.5	3302
17.	Q	Aviation	255.7	151
18.	R	Technology & Services	230	9939
19.	S	Real Estate	226	164
20.	T	Energy	202.11	1054
21.	U	Chemical Industry	198.2	2427
22.	V	Energy	197.5	664
23.	W	Mining Industry	188.9	338
24.	X	Metal Industry	180	5639
25.	Y	Energy	169.7	682

Figure 32: Datasets Supplement 1 for Paper 22

Despite the range of industries selected, the primary criterion for inclusion in this dataset became the magnitude of gross investments made in 2020. It is essential to be aware that this dataset may not explicitly reflect fluctuations or nuances in AI era adoption, as it normally aimed to research the AI technology used and their alignment with unique business targets. This longitudinal dataset spanning 5 years allowed for a comprehensive exploration of AI generation adoption traits in these Finnish businesses, making sure a broader and lengthy-term angle of AI adoption as a phenomenon. It's crucial to understand that this dataset, even as now not explicitly outlined, forms the cornerstone for the following evaluation in this research.

22.5 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S0959652623033553.

23 Paper 23: The role of emerging technologies in implementing green practices to achieve. sustainable operations.

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: [23]

23.1 Summary

This paper examines the impact of integrating emerging technologies such as IoT, AI and blockchain into the manufacturing process to promote sustainable practices. The use of Industry 4.0 technologies enables companies to improve their manufacturing and logistics efficiencies, improve material handling, waste reduction, and environmental performance. The research provides valuable insights for managers, planners, and manufacturers to understand the relationship between Industry 4.0 and green practices for sustainable businesses. Moreover, these green practices have a significant impact on the sustainable performance of companies.

23.2 Software Architecture

An interface where user will be able to interact with different features for different sectors of the sustainable business workforce.

23.3 Data Parameters

The research paper utilized a cross-sectional fact collection method to acquire statistics from 234 manufacturing companies in Pakistan. The study focused on industries such as automobile, cable and electrical goods, cement, chemical and fertilizers, engineering, food, glass and ceramic, leather, paper, pharmaceuticals, textile, Vanaspati and Allied industries, and Synthetic and Rayon manufacturers. These parameters had been crucial in understanding the connection among Industry 4.0, inexperienced manufacturing, green logistics, and sustainability overall performance. By examining these statistical parameters, the researchers had been in a position to analyze the effect of rising technologies on promoting sustainable practices within the production quarter.

23.4 Datasets Used

The study collected data from manufacturing companies in Pakistan and used partial least squares structural equation modeling (PLS-SEM) to test the hypothesis. The data sets used consisted of responses obtained through a questionnaire survey conducted among large manufacturing firms in Pakistan. The data sets provided insights into the adoption of Industry 4.0 technologies, green manufacturing practices, green logistics performance, and sustainability performance within these specific industry sectors. By analyzing these data sets, the researchers were able to draw conclusions and make recommendations regarding the role of emerging technologies in promoting sustainable business practices.

Respondents' summary	No. of firms	Percentage
Title of job		
Operational manager	32	13.6
SC managers	103	44.0
Information system manager	22	9.4
Logistics managers	34	14.5
Plant manager	43	18.3
Job experience		
Less than 4 years	44	18.8
4–10 years	21	8.9
11–15 years	57	24.3
16–20 years	98	41.8
More than 20 years	14	5.9
Industry		
Automobile	21	8.9
Cable and electrical goods	9	3.8
Cement	13	5.5
Chemical and fertilizer	32	13.6
Engineering	14	5.9
Food, jute, sugar and personal product	53	22.6
Glass and ceramic	7	2.9
Leather and tanneries	4	1.7
Pharmaceutical	12	5.1
Textile	59	25.2
Vanaspati and allied industries	3	1.2
Synthetic and rayon	7	2.9

Table 1.
Demographic profile

Figure 33: Datasets Supplement 1 for Paper 23

23.5 Paper Link

Access the full paper at https://www.emerald.com/insight/content/doi/10.1108/TQM-06-2021-0172/full/html?fbclid=IwAR0cvQiFO5L5dHOrgmW-31orG$_{Bs}VcbKtJsOrLnx5QFPgIEoaG$

24 Paper 24: Digital Entrepreneurship and Sustainability: The State of the art and Research agenda

Journal/Conference Rank: Q2
Publication Year: 2022
Reference: [24]

24.1 Summary

This paper provides insights into the intersection of digital entrepreneurship and sustainability. It emphasizes the role of digital technologies in promoting sustainable business practices and achieving sustainable development goals. The findings and research agenda presented in the paper can inform the development of a web application that helps users find and support sustainable businesses, contributing to the promotion of a more sustainable economy and society. The paper identifies three thematic clusters: innovation and entrepreneurship, digital transformation: strategy and business models, and sustainability and sustainable development goals. The findings highlight the potential of digital technologies in offering new possibilities for sustainable business practices and achieving sustainable development goals. The paper also provides a future research agenda, which can be valuable for the development of a web application aimed at helping people find and support sustainable businesses.

24.2 Software Architecture

After interacting with webpage, various articles related to sustainability are collected from SCOPUS database, which is then stored into the system for later use.

24.3 Data Parameters

The data parameters for the bibliometric analysis included the number of publications, the productivity of journals and authors, the impact of publications, and the co-word analysis to identify the conceptual structure and research trends in the field of DE and sustainability. The analysis also considered the most cited articles and the authors' keywords most quoted. These data parameters provided valuable insights into the research landscape and allowed the authors to identify the predominant themes and future research opportunities in the field.

24.4 Datasets Used

The data has been collected from the Scopus database. The authors utilized Scopus to gather the relevant articles on digital entrepreneurship (DE) and sustainability for their study. By searching for specific keywords and applying selection criteria, they obtained a sample of 58 articles that formed the basis for their analysis. The bibliographic data from Scopus provided information on the journals, authors, publication dates, and citation counts, enabling the authors to examine the productivity of journals and authors, track the chronological evolution of publications, and identify the most cited articles. Although the specific data sets within Scopus are not mentioned, the use of this database

suggests a robust and comprehensive collection of scholarly articles in the field of DE and sustainability.

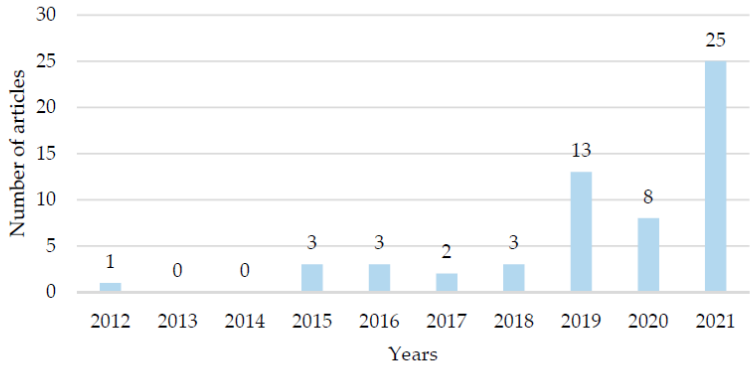


Figure 2. Evolution and quantification of the articles (n = 58).

Table 2. Most publishing journals (two or more articles).

Journal Title	Number of Articles
Sustainability	9
Amfiteatru Economic	2
British Food Journal	2
Journal of Media Business Media	2
Thunderbird International Business Review	2

Table 3. Most cited articles on DE and sustainability.

Figure 34: Datasets Supplement 1 for Paper 24

24.5 Paper Link

Access the full paper at https://www.mdpi.com/2227-7099/11/1/3.

25 Paper 25: Nexus of circular economy and sustainable business performance in the era of digitalization

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [25]

25.1 Summary

This paper explores the integration of circular economy (CE) and sustainable business performance (SBP) in the era of digitalization. The study conducts a comprehensive review and network-based analysis to identify future research directions in this field. The paper highlights the importance of digitalization in developing sustainable circular products and emphasizes the involvement of customers in creating innovative sustainable solutions. It suggests that a move towards a product-service system can accelerate the transformation towards CE and digitalization. The study also discusses the adoption

of digitalization and CE practices to enhance the performance of firms. It emphasizes the need for organizations to minimize resource consumption through information and communication technologies (ICTs) and highlights the role of disruptive technologies in reducing waste and enhancing remanufacturing activities. The research identifies various barriers and challenges associated with the integration of CE and SBP in the context of digitalization, such as lack of funds for I4.0 initiatives and ineffective strategies for integration. It suggests exploring sustainable practices and digital technologies to overcome these obstacles and achieve sustainable supply chain management operations.

25.2 Software Architecture

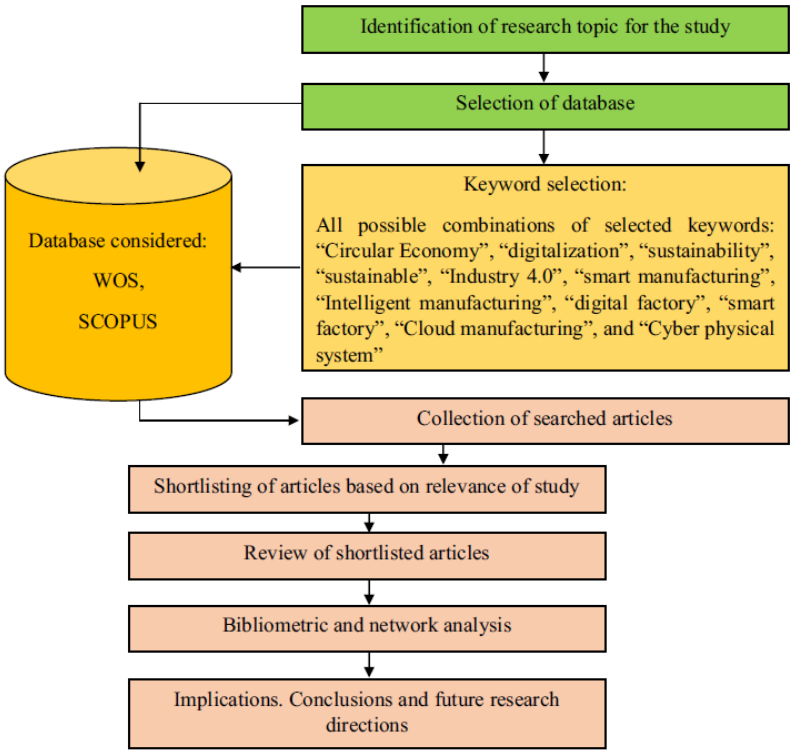


Figure 35: Software architecture diagram for Paper 25.

After interacting with web pages, databases WOS (Web of Science) and SCOPUS utilized to collect articles related to circular economy (CE) and sustainable business performance (SBP) in the context of digitalization. Both databases were chosen to ensure a comprehensive review. A total of 236 articles were initially identified based on the selected keywords. However, book chapters, editorial notes, and doctoral theses were excluded from the search results. The articles were then refined and shortlisted based on the study's scope, removing duplicates with different keyword combinations. Ultimately, 126 articles were considered for further research and analysis.

25.3 Data Parameters

The authors considered parameters related to the adoption of Industry 4.0 technologies, such as the level of integration of Internet of Things (IoT) devices, big data analytics, and artificial intelligence (AI) in the context of circular economy practices. They examined parameters related to sustainable manufacturing, such as resource efficiency, product life cycle extension, and closed-loop systems. These data parameters would have provided insights into the relationship between digitalization, circular economy practices, and sustainable business performance, enabling the authors to analyze and draw conclusions on the subject matter.

25.4 Datasets Used

The authors utilized various datasets related to circular economy, sustainable business practices, and digitalization. These datasets include industry reports, academic studies, surveys, and publicly available data on topics such as the adoption of Industry 4.0 technologies, the integration of digital technologies in supply chains, and the impact of circular economy practices on business performance. Additionally, the authors possibly have collected primary data through interviews or surveys with industry practitioners, policymakers, and managers to gather insights on the adoption of digital technologies and circular economy practices in different sectors. These datasets would have provided the foundation for the analysis and findings presented in the research paper, enabling the authors to draw conclusions and make recommendations regarding the nexus of circular economy and sustainable business performance in the context of digitalization.

25.5 Paper Link

Access the full paper at https://www.emerald.com/insight/content/doi/10.1108/IJPPM-12-2020-0676/full/html.

26 Discussion and Future Planning

26.1 Common Themes

The common themes researched are related to sustainability and sustainability indicators, the impact of web applications and online presence on businesses and consumers, consumer behaviour, social responsibility, and the ease of identifying and supporting sustainable businesses. In particular, the role of sustainability in businesses is highlighted, and papers promote environmental sustainability and responsible digitalization to mutually benefit consumers in improving their quality of life and businesses in reaching and retaining consumers and their support. The papers also highlight the significance of a strong online presence for businesses. They discuss how businesses use digital platforms and technologies to connect with consumers, communicate sustainability efforts, and thrive with a green business model. Technology, particularly online (digital) and blockchain technologies, is a common thread across these papers as well, as businesses leverage it to facilitate sustainable practices and improve user experiences.Several papers emphasize on consumer behavior and how they identify and engage with sustainable

businesses online. Further research is done in examining how consumers' attitudes, values, and perceptions influence exclusive support for sustainable businesses with an online presence. Most researchers mention data collection and analysis methods, such as surveys and structural equation modeling. This indicates a quantitative and empirical research approach to understanding the topics of sustainability, digitalization, and consumer behavior. Overall, these papers collectively address the intersection of sustainability, digitalization, consumer behavior, and business practices, with a focus on understanding how businesses can promote sustainability and effectively communicate their efforts to consumers through digital means.

26.2 Differences and Disagreements

While most papers share a common theme, it is interesting to note that many tend to reach different conclusions (or emphasize different avenues) on how sustainable businesses can be identified and supported through the web, and how to effectively facilitate the intersection of sustainability and digitalization in the business realm. Some suggest a positive relationship between online shopping and customer satisfaction, particularly for those with prior online shopping experience, while others express concerns about the potential adverse environmental and societal consequences of digital technologies. Some highlight the importance of sustainability communication on sophisticated websites, indicating a positive correlation between online presence and sustainability promotion. In contrast, others focus on the role of online platforms in supporting sustainable small and medium-sized enterprises (SMEs), emphasizing their significant impact on sustainable business growth in developing countries. While some studies emphasize the potential benefits of digital presence and online platforms for sustainability and customer satisfaction, others raise concerns about their environmental and societal impacts, highlighting the need for a balanced approach that considers the specific dynamics of the business environment and consumer values. These diverse findings collectively illustrate the complexity and variability inherent in the intersection of digital technologies and sustainability practices within the business landscape. Apart from findings, there are also differences in focus areas – While all papers revolve around sustainability and technology, they differ in their specific focus areas, such as online secondhand shopping, e-commerce, circular economy, and blockchain-based traceability. The papers also investigate different industry contexts, including retail, e-commerce, digital business models, and supply chain management.

26.3 Trends

The common trend across almost all the papers involves sustainable E-commerce: There is a clear trend towards sustainable e-commerce, highlighting the importance of eco-friendly practices and the role of technology in achieving sustainability from the point of view of both consumers and businesses, in terms of identifying these businesses, supporting them through purchases, maintaining continuous engagement, and promoting social responsibility.

26.4 Limitations, Gaps, and Future Work

While most papers follow a meticulous approach in research, there are still some limitations which they acknowledge and wish to work on. These include: (1) The need for

Interdisciplinary Approaches – While these papers address sustainability and technology, there is potential for more interdisciplinary research that combines insights from various fields like environmental science, business, and technology to address sustainability challenges, (2) The need to assess Long-Term Impact – The long-term ecological and economic impact of the sustainable practices discussed in these papers remains to be fully explored. Future research can investigate the scalability and long-term sustainability of these practices, and (3) Regional Context: Most papers focus on geographically restrictive selections of firms, consumers or industries; more research is needed to understand sustainability challenges and solutions in different global regions.

27 Rich Picture

This section provides visual representations of the existing system and proposed system.

27.1 Existing System

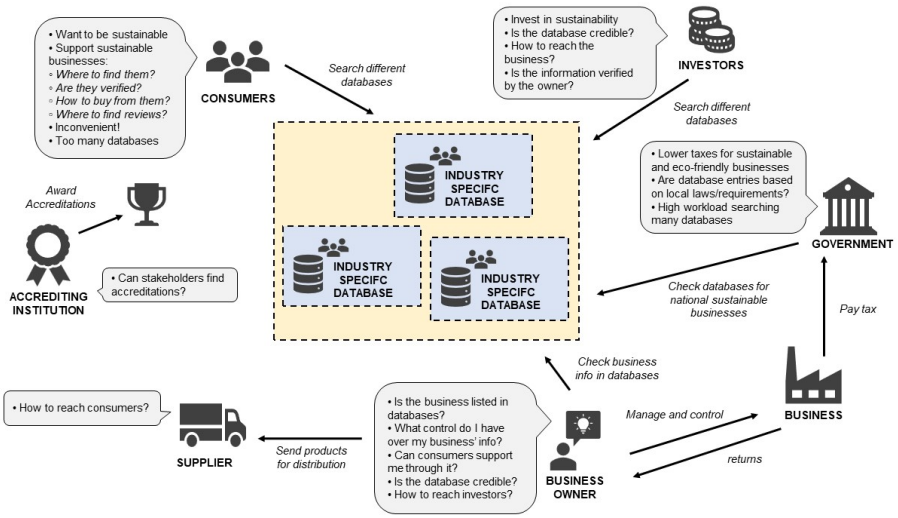


Figure 36: Rich Picture of Existing System

The existing system, based on the conducted literature reviews is found to be fairly complex and inconvenient to use; Interested parties and stakeholders including consumers, investors, and business owners have to search to multiple industry-specific databases such as apparel, healthcare, transport, and others to find businesses which are sustainable. Often, it is the case that such systems include both sustainable and unsustainable businesses, making them difficult to distinguish. The credibility of the databases or the criteria based on which businesses were included in these systems are also not immediately clear, making its use limited due to data integrity concerns. Use is further restricted by gaps in the systems, such as no direct ways to support or contact businesses through the system and scarce availability of service assistance; important links between consumers and business outlets (suppliers), investors and business owners, and more are not evident.

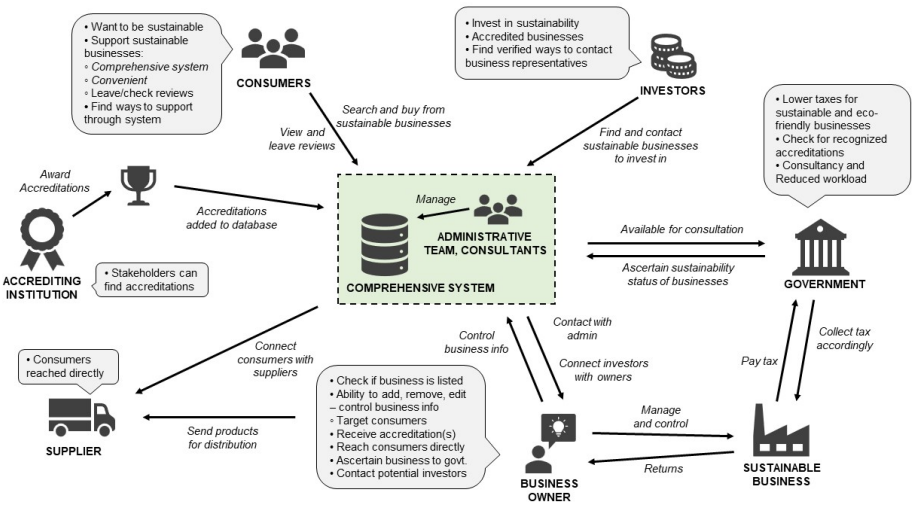


Figure 37: Rich Picture of Proposed System

27.2 Proposed System

The proposed system aims to improve on the existing system, by focusing on service convenience via establishing important links between stakeholders to facilitate finding and supporting sustainable businesses catered to each party's specific requirements. At the center is a comprehensive system with a dedicated administrative and consulting team for effective management, updates, and maintenance. Administrators include businesses in the system based on sustainability accreditations awarded to businesses by reputable accrediting institutions in order to maintain credibility and data integrity. Unlike the existing system, verified business owners have control over the information listed about their business, and can directly add, remove, or edit their business' information. Owner information is also available in the system to facilitate communication between the owner and administrators or potential investors. Investors and consumers can also now search a comprehensive database in the system to search for sustainable businesses in various industries; searches can also be based on other available criteria such as location if required. Consumers now also have a link to suppliers through the system, to be able to purchase from and directly support businesses. The credibility of the system also scales its use to accommodate governments by giving them the ability to ascertain the sustainability status of businesses, who can be subsidized or given tax breaks. Overall, the proposed scheme introduces a holistic system to facilitate the needs and requirements of various stakeholders from consumers, investors, governments, business owners, and more to enable searching for and supporting sustainable businesses through convenient and effective means.

28 Entity Relationship Diagram

Provided is an Entity Relationship Diagram (ERD) to represent the data model consisting various entities and their attributes, and the relationships between such entities in the database. The ERD is the framework used to structuralize the database.

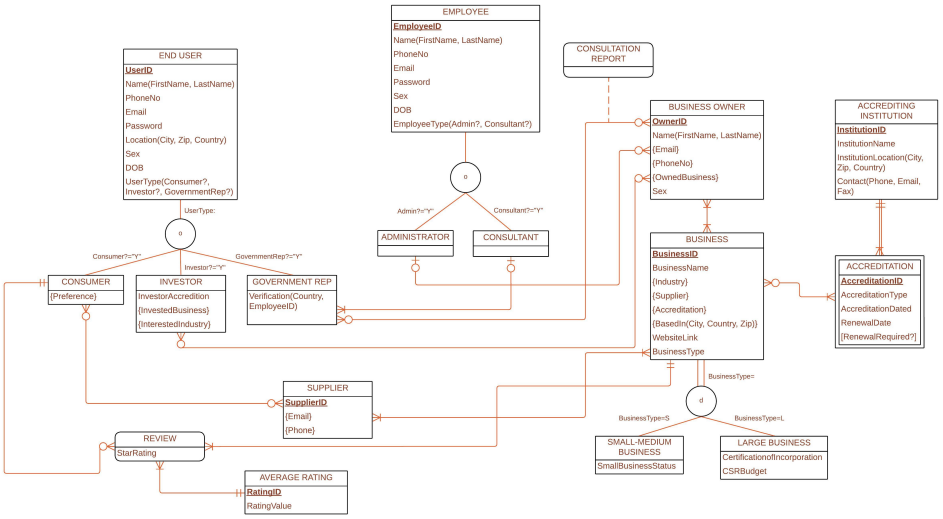


Figure 38: Entity Relationship Diagram of Proposed System

28.1 Business Rules

The provided Entity Relationship Diagram is based on the following business rules:
Data is kept on the listed entities: End Users (Including Consumers, Investors, and Government Representatives), Employees (Including Administrators and Consultants), Business Owners, Businesses (Covering both Small-Medium and Large Businesses), Suppliers, Consumers, Reviews, Average Ratings, Accrediting Institutions, and Accreditations. The attributes recorded for each of these entities are observable in the provided entity relationship diagram.
A business owner can own one or multiple businesses, and a business can be owned by one or many business owner. An administrator can work with multiple business owners, and a business owner can work with an assigned administrator. A business owner can be in contact with multiple investors and an investor can contact multiple business owners. A business owner can be contacted by multiple government representatives and a government representative can contact multiple business owners.
A business has one or many accreditations, and an accreditation can be given to one or many businesses. A business has at least one supplier and a listed supplier stocks products from one or many business. Each business has an average rating. A supplier can sell to multiple consumers and a consumer can buy from one or many suppliers.
A consumer can leave reviews for various businesses. A business has an average rating from multiple reviews by various consumers; The average rating is assigned to each business based on reviews from consumers.
An accrediting institution can award many accreditations, but each accreditation is awarded by one accrediting institution.
A government representative can consult with one assigned consultant where each consultant is assigned to one or multiple government representatives.

29 Relational Schema

The Entity Relationship Diagram has been used to derive a relational schema by mapping entities and the relationships between them. The aim is to logically represent the

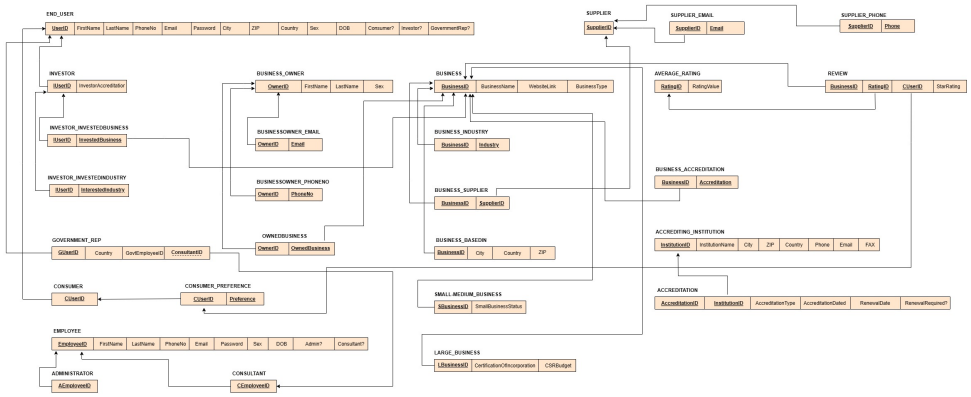


Figure 39: Relational Schema of Proposed System

structure of the proposed relational database, highlighting relations, attributes, primary and foreign keys, and the relationship between entities and attributes within the proposed system.

30 Normalization

The schema is normalized to organize data in the proposed system by reducing redundancy and dependency.

30.1 Notations

Entity	Attribute	Notation
EMPLOYEE	EmployeeID	E1
	FirstName	E2
	LastName	E3
	PhoneNo	E4
	Email	E5
	Password	E6
	Sex	E7
	DOB	E8
	Admin?	E9
	Consultant?	E10
END USER	UserID	U1
	FirstName	U2
	LastName	U3
	PhoneNo	U4
	Email	U5
	Password	U6
	City	U7
	Zip	U8
	Country	U9
	Sex	U10
	DOB	U11

Continued on next page

Table 1 – continued from previous page

Entity	Attribute	Notation
	Consumer?	U12
	Investor?	U13
	GovernmentRep?	U14
CONSUMER	Preference	C1
INVESTOR	InvestorAccredition	I1
	BusinessID	B1
	InterestedIndustry	I2
GOVERNMENT REP	Country	G1
	EmployeeID	G2
SUPPLIER	SupplierID	S1
	Email	S2
	Phone	S3
REVIEW	StarRating	X1
AVERAGE RATING	RatingID	R1
	RatingValue	R2
BUSINESS OWNER	OwnerID	O1
	FirstName	O2
	LastName	O3
	Email	O4
	PhoneNo	O5
	BusinessID	B1
	Sex	O6
BUSINESS	BusinessID	B1
	BusinessName	B2
	Industry	B3
	SupplierID	S1
	AccreditationID	A1
	City	B4
	Country	B5
	Zip	B6
	WebsiteLink	B7
	BusinessType	B8
SMALL-MEDIUM BUSINESS	SmallBusinessStatus	M1
LARGE BUSINESS	CertificateofIncorporation	L1
	CSRBudget	L2
ACCREDITING INSTITUTION	InstitutionID	AI1
	InstitutionName	AI2
	City	AI3
	Zip	AI4
	Country	AI5
	Phone	AI6
	Email	AI7
	Fax	AI8
ACCREDITATION	AccreditationID	A1
	AccreditationType	A2

Continued on next page

Table 1 – continued from previous page

Entity	Attribute	Notation
	AccreditationDated	A3
	RenewalDate	A4
	RenewalRequired?	A5

Table 1: Entity-Attribute Notations

30.2 First Normal Form (1NF)

No repeating groups and at least one primary key.

E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
U1	U2	U3	U4	U5	U6	U7	U8	U9	U10
U11	U12	U13	U14	C1	I1	I2	G1	G2	**S1**
S2	S3	X1	**R1**	R2	**O1**	O2	O3	O4	O5
O6	**B1**	B2	B3	B4	B5	B6	B7	B8	M1
L1	L2	**AI1**	AI2	AI3	AI4	AI5	AI6	AI7	AI8
A1	A2	A3	A4	A5					

Figure 40: Normalization in 1NF

30.3 Second Normal Form (2NF)

Partial dependencies are eliminated.

E1	E2	E3	E4	E5	E6	E7	E8	E9	E10				
U1	U2	U3	U4	U5	U6	U7	U8	U9	U10	U11	U12	U13	U14
R1	R2												
O1	O2	O3	O4	O5	O6	B1	B2	B3	B4	B5	B6	B7	B8
AI1	AI2	AI3	AI4	AI5	AI6	AI7	AI8						

A1	A2	A3	A4	A5	S1	S2	S3						

Figure 41: Normalization in 2NF

30.4 Third Normal Form (3NF)

No transitive dependencies.

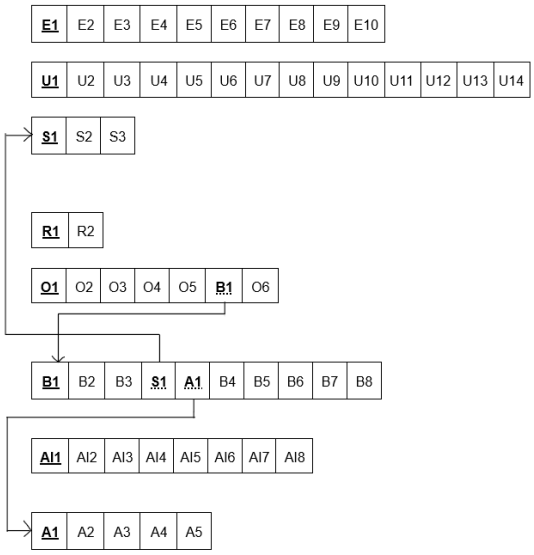


Figure 42: Normalization in 3NF

30.5 Boyce Codd Normal Form (BCNF)

The relations in 3NF are also in BCNF.

31 Data Dictionary

Name	Data Type	Size	Remark
EmployeeID	INT	7	Primary Key representing the unique identifier for each employee
FirstName	VARCHAR	20	First name of the employee. Ex- Jahin
LastName	VARCHAR	20	Last name of the employee Ex- Ferdous
PhoneNo	VARCHAR	15	Phone number of the employee.
Email	VARCHAR	40	Email address of the employee
Password	VARCHAR	15	Password for accessing the system
Sex	CHAR	6	Gender of the employee (e.g., 'M' for Male, 'F' for Fem
DOB	DATE	-	Date of Birth of the employee
Admin?	BOOLEAN	-	Boolean indicating whether the employee has admin priv
Consultant?	BOOLEAN	-	Boolean indicating whether the employee is a consulta

Table 2: employee_T

Name	Data Type	Size	Remark
AEmployeeID	INT	7	Primary Key representing the unique identifier for the admin.

Table 3: administrator_T

Name	Data Type	Size	Remark
CEmployeeID	INT	7	Primary Key representing the unique identifier for each consult

Table 4: consultant_T

Name	Data Type	Size	Remark
UserID	INT	7	Primary Key representing the unique identifier for
FirstName	VARCHAR	20	First name of the end user.
LastName	VARCHAR	20	Last name of the end user.
PhoneNo	VARCHAR	15	Phone number of the end user.
Email	VARCHAR	40	Email address of the end user.
Password	VARCHAR	15	Password for accessing the system.
City	VARCHAR	20	City of residence of the end user.
Zip	VARCHAR	5	ZIP code of the end user.
Country	VARCHAR	20	Country of residence of the end user
Sex	CHAR	5	Gender of the end user.
DOB	DATE	dd/mm/yy	Date of Birth of the end user.
Consumer?	BOOLEAN	-	Boolean indicating whether the end user is a
Investor?	BOOLEAN	-	Boolean indicating whether the end user is a
GovernmentRep?	BOOLEAN	-	Boolean indicating whether the end user is a governm

Table 5: end_user_T

Name	Data Type	Size	Remark
CUserID	INT	7	Primary Key representing the unique identifier for each consumer. E

Table 6: consumer_T

Name	Data Type	Size	Remark
CUserID	INT	7	Primary Key representing the unique identifier for each consumer.
Preference	VARCHAR	50	Industry that the consumer is preferring. Ex: Health, Fo

Table 7: consumer_preferences_T

Name	Data Type	Size	Remark
IUserID	INT	7	Primary Key representing the unique identifier for each
InvestorAccreditatior	VARCHAR	40	-

Table 8: investor_T

Name	Data Type	Size	Remark
IUserID	INT	7	Primary Key representing the unique identifier for each inve
InvestedBusiness	VARCHAR	40	Name of business that the investor has invested in. E

Table 9: investor_investedbusiness_T

Name	Data Type	Size	Remark
IUserID	INT	7	Primary Key representing the unique identifier for each inve
InvestedIndustry	VARCHAR	40	Name of industry that the investor has invested in. Ex- Tex

Table 10: investor_investedindustry_T

Name	Data Type	Size	Remark
GUserID	INT	7	Primary Key representing the unique identifier for each gov
Country	VARCHAR	20	Country the person is representing
GovtEmployeeID	INT	7	Government ID of the Representative.
ConsultantID	INT	7	Primary Key representing the unique identifier for each cons

Table 11: government_rep_T

Name	Data Type	Size	Remark
SupplierID	INT	7	Primary Key representing the unique identifier for each supplier

Table 12: supplier_T

Name	Data Type	Size	Remark
SupplierID	INT	7	Primary Key representing the unique identifier for each supplier
Email	VARCHAR	40	Email of the registered business owner. Ex- dbms@gmail.com

Table 13: supplier_email_T

Name	Data Type	Size	Remark
SupplierID	INT	7	Primary Key representing the unique identifier for each supplier
Phone	VARCHAR	15	Contact number of the registered supplier. Ex- 01711431290

Table 14: supplier_phone_T

Name	Data Type	Size	Remark
BusinessID	INT	7	ID of the registered business. Ex- 2134768
RatingID	INT	7	Primary Key representing the unique identifier for each ra
CUserID	INT	7	Primary Key representing the unique identifier for each consumer.
StarRating	FLOAT	3	Float representing the consumer individual rating of a bus

Table 15: review_T

Name	Data Type	Size	Remark
RatingID	INT	7	Primary Key representing the unique identifier for each rating.
RatingValue	FLOAT	3	Float representing the average rating value.

Table 16: average_rating_T

Name	Data Type	Size	Remark
OwnerID	INT	7	ID of the registered business owner. Ex- 2134768
FirstName	VARCHAR	20	First name of the registered business owner. Ex- Sazin
LastName	VARCHAR	20	Last name of the registered business owner. Ex- Noor
Sex	CHAR	6	Gender of the registered business owner. Ex-Female

Table 17: business_owner_T

Name	Data Type	Size	Remark
OwnerID	INT	7	ID of the registered business owner. Ex- 2134768
Email	VARCHAR	40	Email of the registered business owner. Ex- dbms@gmail.com

Table 18: businessowner_email_T

Name	Data Type	Size	Remark
OwnerID	INT	7	ID of the registered business owner. Ex- 2134768
PhoneNo	VARCHAR	15	Contact number of the registered business owner. Ex- 01711431290

Table 19: businessowner_phoneno_T

Name	Data Type	Size	Remark
OwnerID	INT	7	ID of the registered business owner. Ex- 2134768
OwnedBusiness	VARCHAR	25	-

Table 20: ownedbusiness_T

Name	Data Type	Size	Remark
BusinessID	INT	7	ID of the registered business. Ex- 2134768
BusinessName	VARCHAR	40	Name of the registered business. Ex- Apple, Google
WebsiteLink	HYPERLINK	-	Link to the business website
BusinessType	VARCHAR	20	Indicating whether the business is small-medium or large

Table 21: business_T

Name	Data Type	Size	Remark
BusinessID	INT	7	ID of the registered business. Ex- 2134768
Industry	VARCHAR	20	Industry of the business Ex- Health, Food etc

Table 22: business_industry_T

Name	Data Type	Size	Remark
BusinessID	INT	7	ID of the registered business. Ex- 2134768
SupplierID	INT	7	Primary Key representing the unique identifier for each supplier

Table 23: business_supplier_T

Name	Data Type	Size	Remark
BusinessID	INT	7	ID of the registered business. Ex- 2134768
City	VARCHAR	20	City where the business is located
Country	VARCHAR	20	Country where the business is located
Zip	VARCHAR	5	Zip code of the business location

Table 24: business_basedin_T

Name	Data Type	Size	Remark
SBusinessID	-	-	Certificate number of the small business status.
SmallBusinessStatus	INT	7	Certificate number of the small business status.

Table 25: smallmedium_business_T

Name	Data Type	Size	Remark
LBusinessID	-	-	Certificate number of the large business incorpora
CertificateofIncorporation	INT	7	Certificate number of the large business incorpora
CSRBudget	INT	7	Budget assigned to ensure corporate social responsi

Table 26: large_business_T

Name	Data Type	Size	Remark
BusinessID	INT	7	ID of the registered business. Ex- 2134768
Accreditation	VARCHAR	20	Accreditations that are awarded to the business.

Table 27: business_accreditation_T

Name	Data Type	Size	Remark
InstitutionID	INT	7	ID of the accrediting institution
InstitutionName	VARCHAR	20	Name of the accrediting institution
City	VARCHAR	20	City where the accrediting institution is located
Zip	VARCHAR	5	Zip code of the accrediting institution
Country	VARCHAR	20	Country where the accrediting institution is located
Phone	VARCHAR	15	Contact phone number of the accrediting institution
Email	VARCHAR	40	Contact email of the accrediting institution
Fax	VARCHAR	15	Fax number of the accrediting institution

Table 28: accrediting_institution_T

Name	Data Type	Size	Remark
AccreditationID	INT	7	ID of the Accreditation awarded. Ex- 2134768
InstitutionID	INT	7	ID of the accrediting institution
AccreditationType	VARCHAR	40	Type of the Accreditation awarded.
AccreditationDated	DateTime	-	Date when accreditation was awarded. Ex- 23/2/2022
RenewalDate	DateTime	-	Date when accreditation has to be renewed. Ex- 21/1/202
RenewalRequired?	BOOLEAN	-	Whether or not a renewal of accreditation is required.

Table 29: accreditation_T

32 Front End

32.1 Sign Up and Login Interface

The sign-up and login page provides a seamless on boarding experience for users, ensuring a smooth entry into the platform. During sign-up, essential analytical information such as location, stakeholder type, and others are collected. The intuitive design facilitates a quick and straightforward registration process, guiding users in joining the sustainable community.

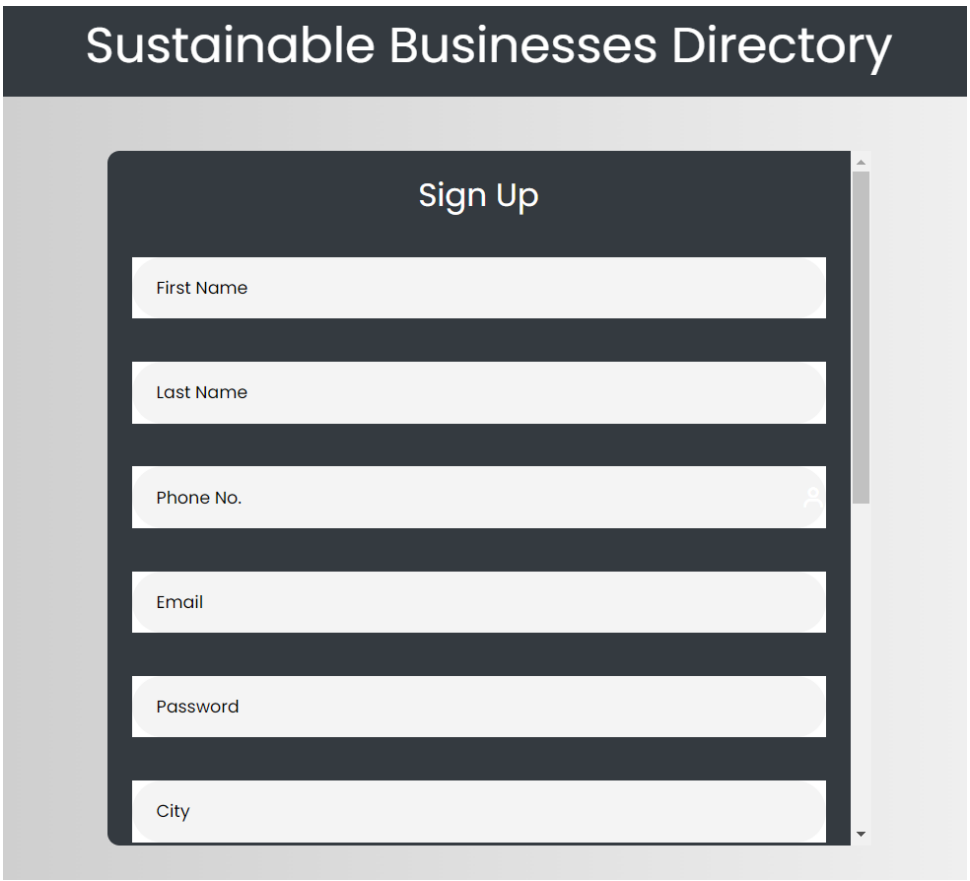


Figure 43: Sign Up

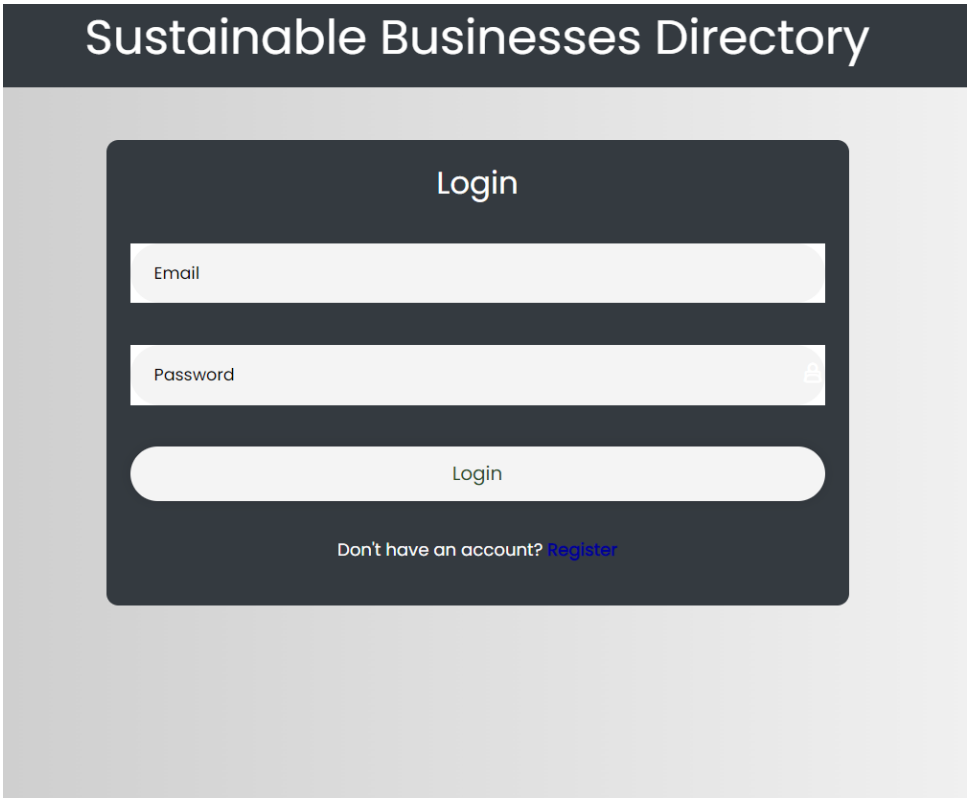


Figure 44: Sign Up

32.2 End User Interface and Dashboard

The end user dashboard serves as a centralized hub for consumers and professionals (i.e.: investors and government representatives) to navigate through various features. The navigation bar presents easy access to a comprehensive list of sustainable businesses and opportunities to support them, alongside supplementary resources such as a list of owners of sustainable businesses, and a list of accreditations received by each business. The interactive table within the dashboard listing sustainable businesses features hyperlinks redirecting users to the businesses' websites.

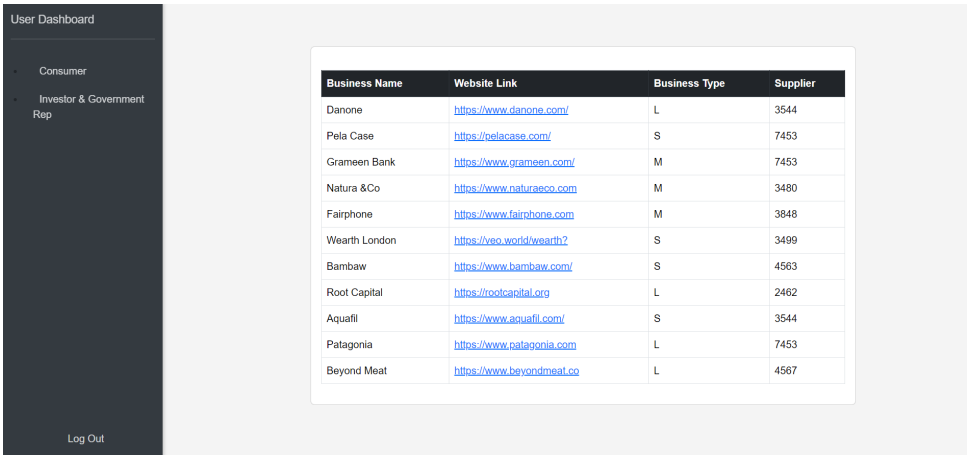
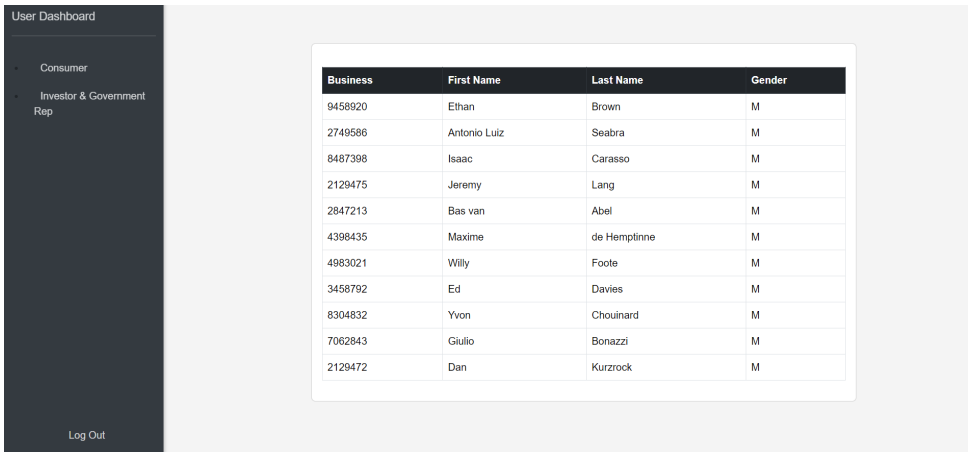
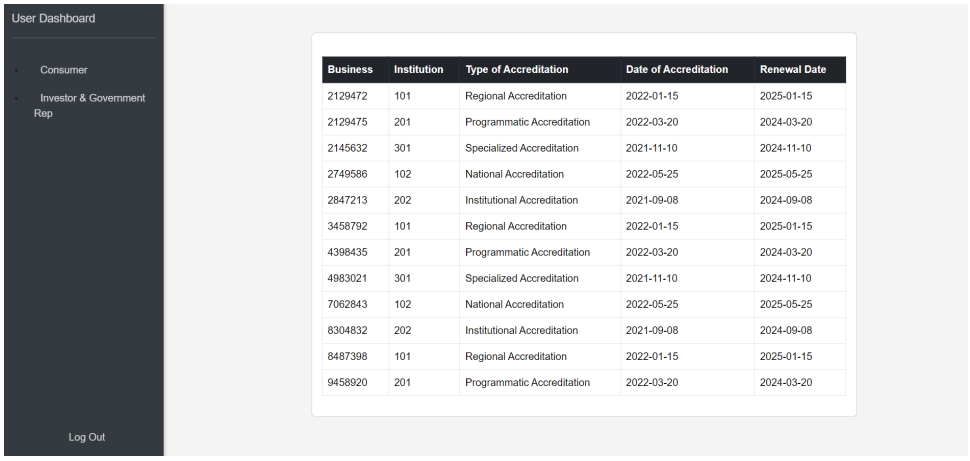


Figure 45: List of Sustainable Businesses



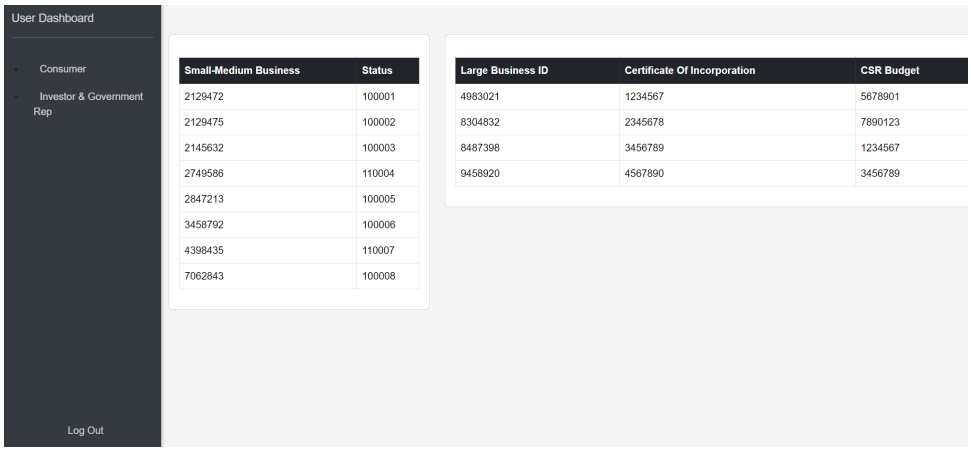
Business	First Name	Last Name	Gender
9458920	Ethan	Brown	M
2749586	Antonio Luiz	Seabra	M
8487398	Isaac	Carasso	M
2129475	Jeremy	Lang	M
2847213	Bas van	Abel	M
4398435	Maxime	de Hemptinne	M
4983021	Willy	Foote	M
3458792	Ed	Davies	M
8304832	Yvon	Chouinard	M
7062843	Giulio	Bonazzi	M
2129472	Dan	Kurzrock	M

Figure 46: List of Owners of Sustainable Businesses



Business	Institution	Type of Accreditation	Date of Accreditation	Renewal Date
2129472	101	Regional Accreditation	2022-01-15	2025-01-15
2129475	201	Programmatic Accreditation	2022-03-20	2024-03-20
2145632	301	Specialized Accreditation	2021-11-10	2024-11-10
2749586	102	National Accreditation	2022-05-25	2025-05-25
2847213	202	Institutional Accreditation	2021-09-08	2024-09-08
3458792	101	Regional Accreditation	2022-01-15	2025-01-15
4398435	201	Programmatic Accreditation	2022-03-20	2024-03-20
4983021	301	Specialized Accreditation	2021-11-10	2024-11-10
7062843	102	National Accreditation	2022-05-25	2025-05-25
8304832	202	Institutional Accreditation	2021-09-08	2024-09-08
8487398	101	Regional Accreditation	2022-01-15	2025-01-15
9458920	201	Programmatic Accreditation	2022-03-20	2024-03-20

Figure 47: List of Accreditation Received by Sustainable Businesses



Small-Medium Business	Status
2129472	100001
2129475	100002
2145632	100003
2749586	110004
2847213	100005
3458792	100006
4398435	110007
7062843	100008

Large Business ID	Certificate Of Incorporation	CSR Budget
4983021	1234567	5678901
8304832	2345678	7890123
8487398	3456789	1234567
9458920	4567890	3456789

Figure 48: Distinguished Lists of Sustainable Businesses by Type

32.3 Administrator Interface and Dashboard

The administrator (admin) dashboard serves as an interactive command center for management, updates, and maintenance. Administrators have control over (adding, viewing, updating, and deleting) all the data included in the sustainable business database including sustainable businesses, business owners, end users, and others. For convenience, this can be done directly through the dashboard, and available forms, graphs, and tables.

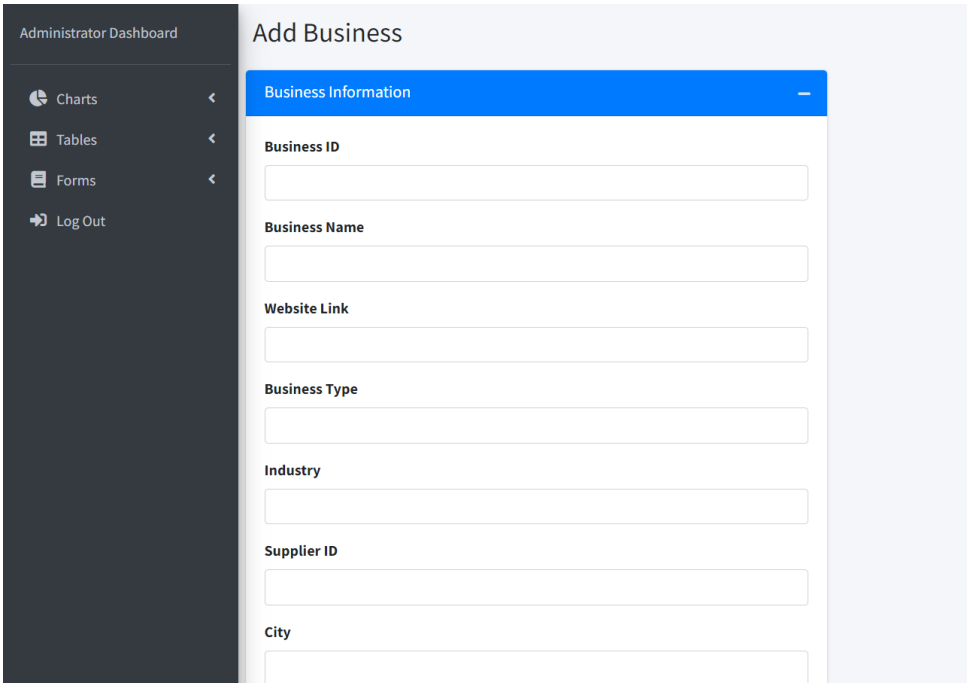


Figure 49: Add Business Form

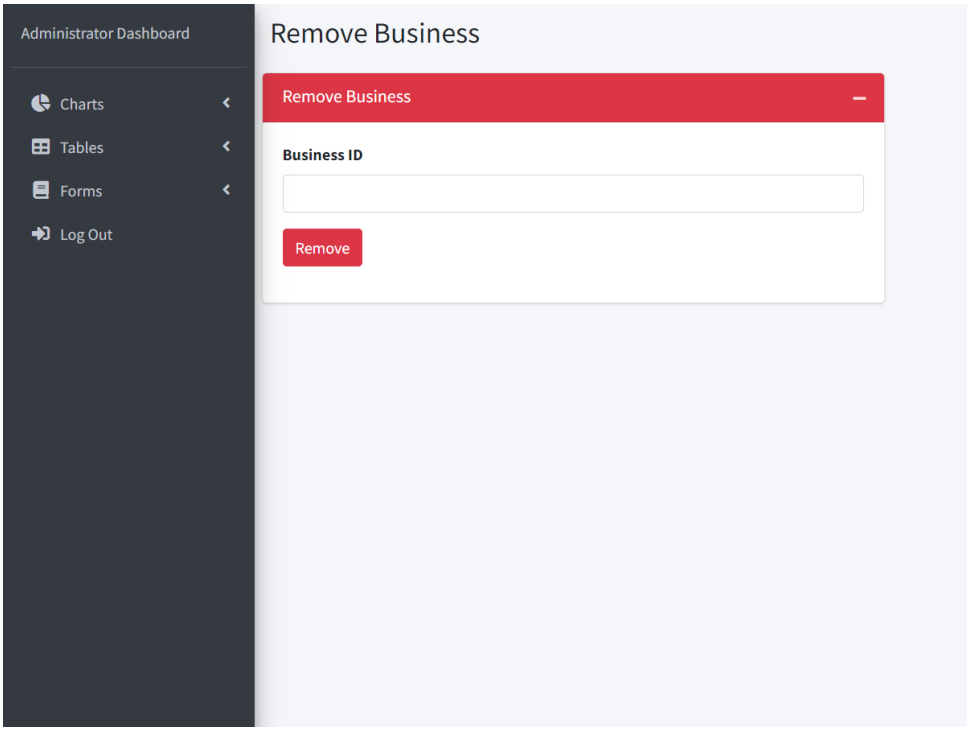


Figure 50: Remove Business Form

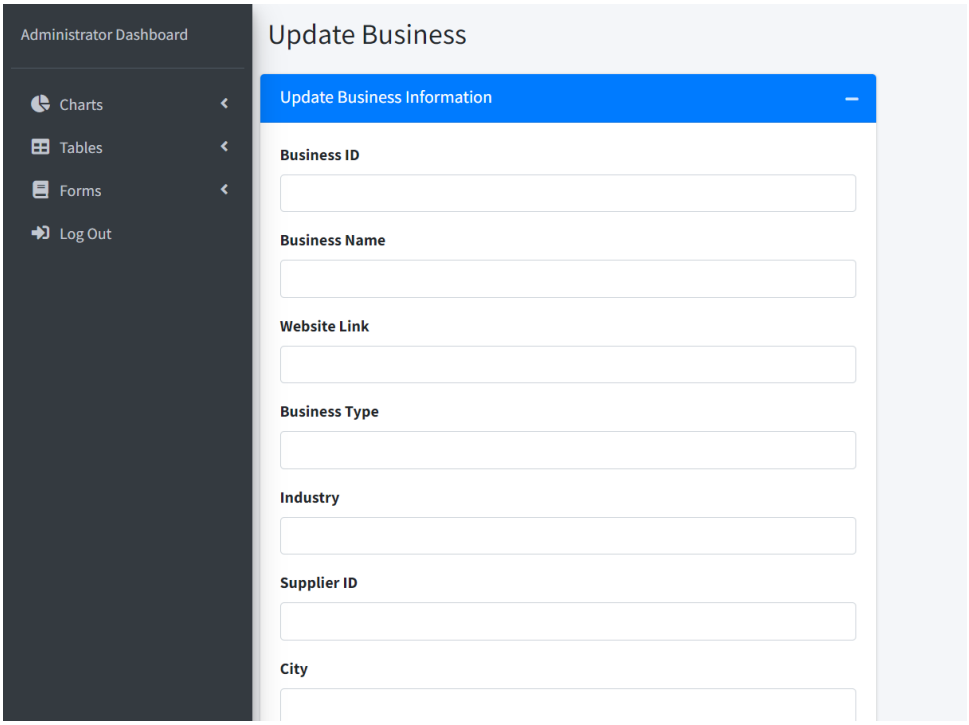


Figure 51: Update Business Form

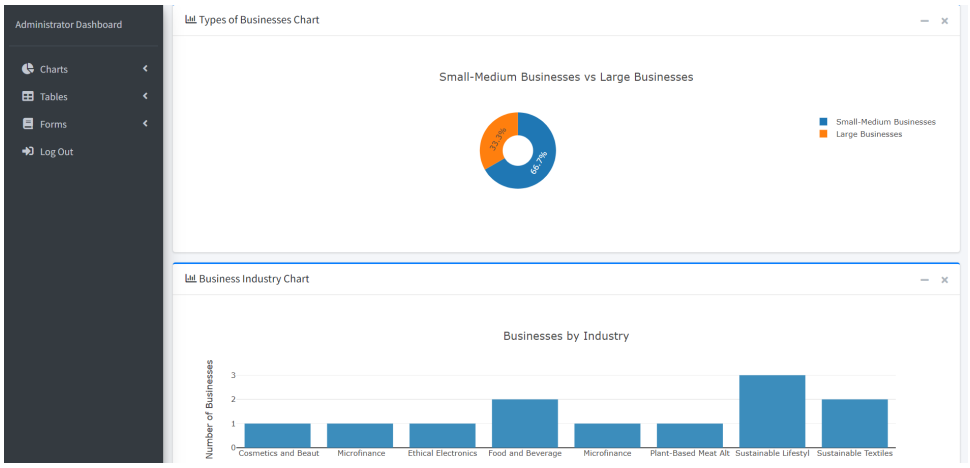


Figure 52: Info-graphic Charts

32.4 Consultant Interface and Dashboard

The consultant dashboard is important to maintain a connection between the database and officials. It allows consultants to view verified government representatives who are using the database, and to whom they are assigned to. This establishes effective communication channels for any questions, concerns, or comments relevant to the platform. The initiative not only helps users with queries, but also ensures that the database can remain updated, reliable, and convenient as per official data.

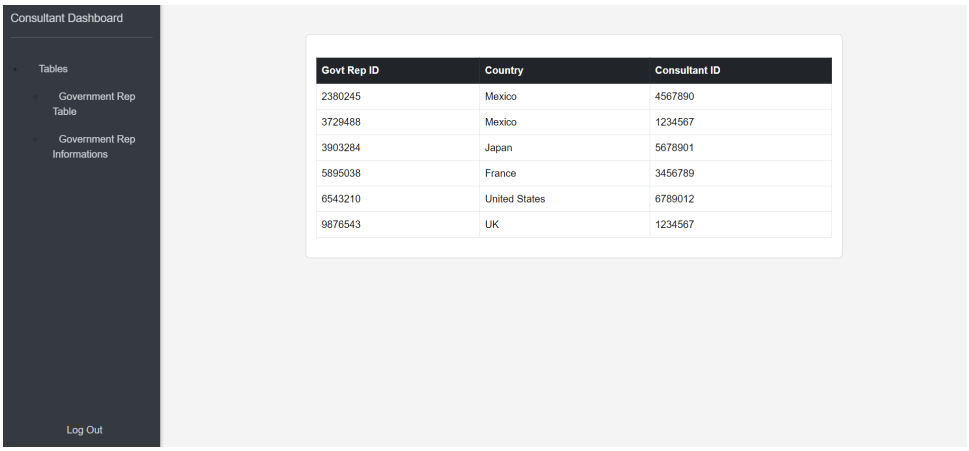


Figure 53: List of Assigned Consultants

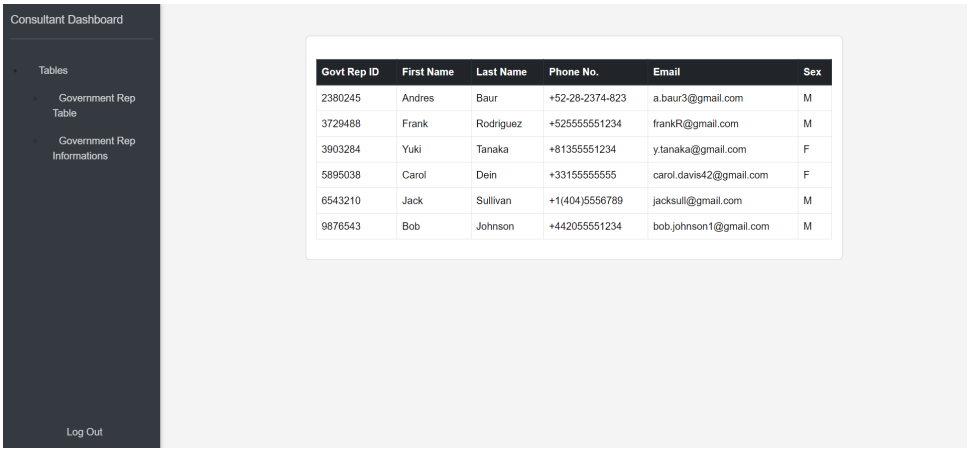


Figure 54: List of Government Representatives

33 Acknowledgements

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