1 *Review*

2 Sustainable business models: a review

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16 **Abstract:** During the past two decades of the e-commerce growth the concept of business model has become increasingly popular. More recently, the research on this realm has grown rapidly with a diverse research activity covering a wide range of application areas. Considering the sustainable development goals the innovative business models have brought competitive advantage to improve the sustainability performance of organizations. The concept of sustainable business model describes the rationale of how an organization creates, delivers, and captures value, in economic, social, cultural or other contexts in a sustainable way. The process of sustainable business model construction forms an innovative part of business strategy. Different industries and businesses have utilized sustainable business models concept to satisfy their economic, environmental and social goals simultaneously. However, the success, popularity, and the progress of sustainable business models in different application domains are not clear. To explore this issue, this research provides a comprehensive review on sustainable business models literature in various application areas. Notable sustainable business models are identified and further classified in fifteen unique categories, and in every category the progress (either failure or success) has been reviewed and the research gaps are discussed. Taxonomy of the applications includes, innovation, management and marketing, entrepreneurship, energy, fashion, healthcare, agri-food, supply chain management, circular economy, developing countries, engineering, construction and real estate, mobility and transportation, and hospitality. The key contribution of this study is to provide an insight about the state of the art of sustainable business models in various application areas and the future research directions. This paper concludes that popularity and the success rate of sustainable business models in all application domains have been increased along with increasing use of advanced ICT technologies.

38 **Keywords:** sustainable business model; sustainable development; sustainability; business model;

1. Introduction

The business model concept is an abstract representation of the value flow and the interactions between value elements of an organizational unit. The essential value elements of organizations concern with proposition, creation, delivering, and capturing the value. A simplified way of communicating the connection and function of these elements is vital in the success of any business [1]. For this purpose, the concept of business model has originated to better present the complex business ideas more efficiently. Through a business model the business workflow is communicated to investors in detailed within a short time frame [2]. In fact, the effective representation of planning, analysis, communication, and implementation of organizational complex units' performance are reported as one of the major reason behind the popularity of business models [3]. Geissdoerfer et al. [4] presents a detailed review on the different types and various definitions of business models where a vast number of definitions are presented. Model of an organizational system [5], a simplified characteristic of business concept [6], and a reduced scope of business [7] are suggested as the various types of the business models. For decades the vital sustainability issues with their major societal and environmental effects influencing the human being and the nature had not been the priorities of most business model types. Nevertheless, business models, for achieving the sustainability goals of the companies have finally become under pressure to transform into a more sustainable economic system.

Internationalization along with the urge to keep up with the sustainable development goals had made the worldwide competition among the firms complex, and the conventional business models had been struggling with finding the promising solutions to win the competitions. In this context, the alternative concept of sustainable business model has brought competitive advantage to the organizations through empowering the conventional business models meeting the sustainable development goals while maintaining productivity and profitability [8, 9]. Thus, creating value for triple bottom line, i.e. economic, society and environment has been the ultimate goal of sustainable business models [10]. Sustainable business models have the great potential to incorporate the principles of sustainability and integrate sustainability goals into the value proposition, value creation, and value capture activities of businesses [11]. Sustainable business models aim at employing proactive multi-stakeholder management, innovation, and long-term perspective to meet the sustainability goals. Sustainable business models, therefore, have been effectively contributing in reducing the harmful effects of business activities on the environment and society through providing solutions to the firms to help them meeting their economic and sustainability goals simultaneously [12]. Thus, the concept of sustainable business model has emerged to provide a platform for integrating sustainability considerations [13]. From this perspective circular business models [14] share similarity with sustainable business models. However they include additional characteristics which are mainly concerned with slowing, intensifying, and narrowing resource loops [4].

The review paper of Evans et al. [15] shows how sustainable business models have helped businesses to achieve their sustainability ambitions. Further research, e.g. Boons et al. [11], Geissdoerfer et al. [4] and Schaltegger et al. [9] provide a collection of the definitions to the concept of sustainable business model. Although, there exists literature on the definitions and overview of the concept of the sustainable business model, there is a research gab in the progress and evaluation of the performance of sustainable business models in each specific application domains. The

85 widespread and effectiveness of the sustainable business models in business domains has not been
86 identified. Furthermore, the applicability, popularity, success, and the future trends in various
87 business domains have not been not discussed yet. Consequently, the contribution of this article is to
88 present a classification of the widespread applications of sustainable business models in addition to
89 an in-depth investigation on various applications domains considering the success and failure cases.
90   The rest of this paper is structured as follow. Section two presents the methodology of the
91 review. Section three presents the taxonomy of the research and the review's initial report. Further,
92 the in the fourteen subchapters the applications of s in the individual categories presented. Section
93 four and five present the discussion and conclusions of the research, respectively where paper
94 concludes with a short discussion of the findings and some final remarks.
95

2. Method

97   The primary goal of this survey is to present the state of the art of s in the individual
98 application areas. Accordingly, the research methodology has been developed to identify, classify
99 and review the notable peer-reviewed articles in design and implementation of sustainable
100 business models in top-level subject fields. Through the search query of "business model*" and
101 "sustainab*" for title, abstract and keywords the relevant literatures are identified. The query of
102 (TITLE-ABS-KEY ("business model*") AND TITLE-ABS-KEY (sustainab*)) would result in 3,494
103 document results. However, through axillary search keywords such as "sustainable development" in
104 all fields of the paper we make sure that the most relevant papers are identified and the paper
105 significantly contribute to the definition of sustainable development. Consequently, the alternative
106 search query of (TITLE-ABS-KEY ("business model*") AND TITLE-ABS-KEY (sustainab*) AND ALL
107 ("sustainable development")) would result in 1,584 document results which forms our initial
108 database. Using the Thomson Reuters Web-of-Science and Elsevier Scopus for implementation of the
109 search queries would assure that any paper in data base would meet the four types of quality
110 measure, i.e., source normalized impact per paper (SNIP), CiteScore, SCImago journal rank (SJR), and
111 h-index.
112   The research methodology follows a comprehensive and structured workflow based on a
113 systematic database search and cross-reference snowballing. The flowchart of the research
114 methodology is presented in figure 3. The method is considered as a modified version of review
115 proposed by Easterby-Smith et al. (2015).
116   In the first step the search queries explore the Thomson Reuters Web-of-Science and Elsevier
117 Scopus databases. In the second step the abstract and keywords of the identified articles are
118 browsed to identify the relevant literature, and exclude the irrelevant ones. In step three the
119 database of the relevant articles is created. In step four, the article is carefully read and the
120 category of the application is identified accordingly. In this step the expert based knowledge and
121 the initial preferences would influence the number and the type of the categories. In step five we
122 decide on generating a new category and export the article in a new table of application domain
123 or pass the article to the step six where a category would host an article in its table. Once a category
124 created for a new article, in the step seven, we pass that article to that category. In the step eight
125 we save the content of our database in various categories, update the content of the tables, and
126 review the papers. This workflow will be repeated until sorting out all the papers.

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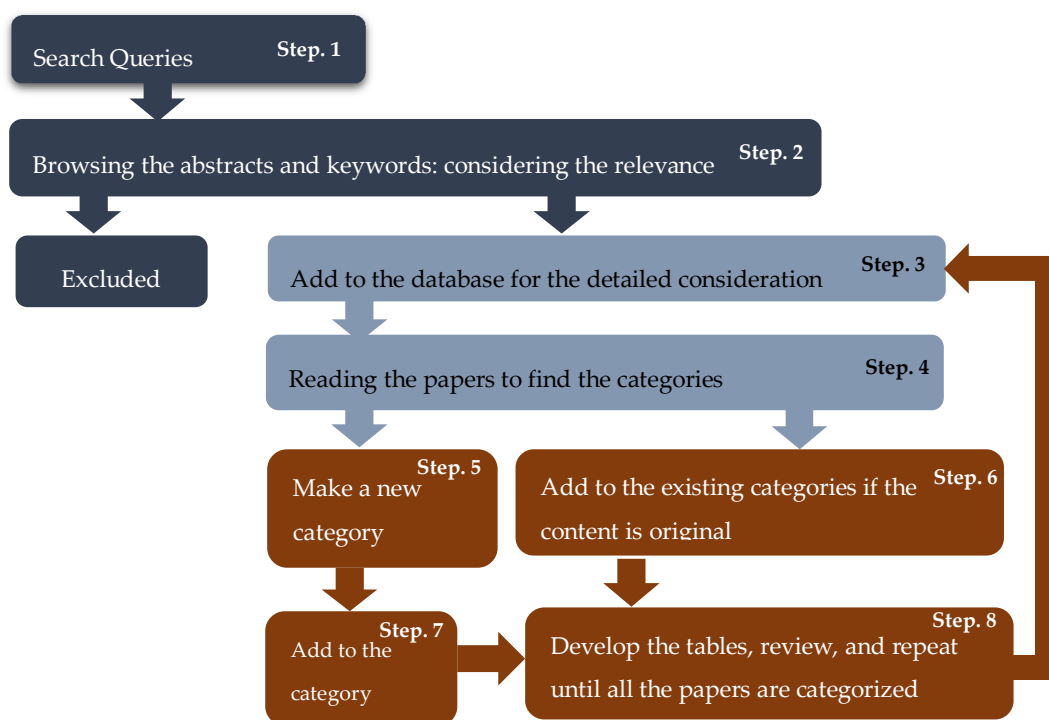
134   Figure 1. Flowchart of the methodology of research

135

3. Review

Studying the initial database communicates interesting information. As it is depicted in figure 4, the number of publications in sustainable business model is remarkably increased during the past two decades. It implies that one of the major solutions for sustainable development is sustainable business model and the firms have utilized sustainable business models to have eco-socio friendly business activities.

Furthermore, the nature of a particular business is very determinant in the approaches that the firms can select for their sustainable business models. In fact, the solutions provided in the literature present different characteristics for implementation of sustainable business models according to the business domain. On the other hand, that implementation of a sustainable business model implies new challenges, innovation or adjustment with new activities. Since sustainability deal with triple bottom line factors, addition to the financial benefit [14, 16, 17] the benefits of multiple-stakeholders such as customers, suppliers, shareholders etc. have been considered in the sustainable development. Therefore, transition toward sustainable business models requires to look beyond the entity of the firm and it needs innovation activities to create value for triple bottom line. Hence, Incremental changes are insufficient to encounter with sustainable development challenges [18, 19]. The current study provides insights about the research path of sustainable business model. The paper, as a literature review, increase the knowledge of how different industries, sectors, research areas apply sustainable business models in order to achieving sustainability goals and reaching sustainable development.

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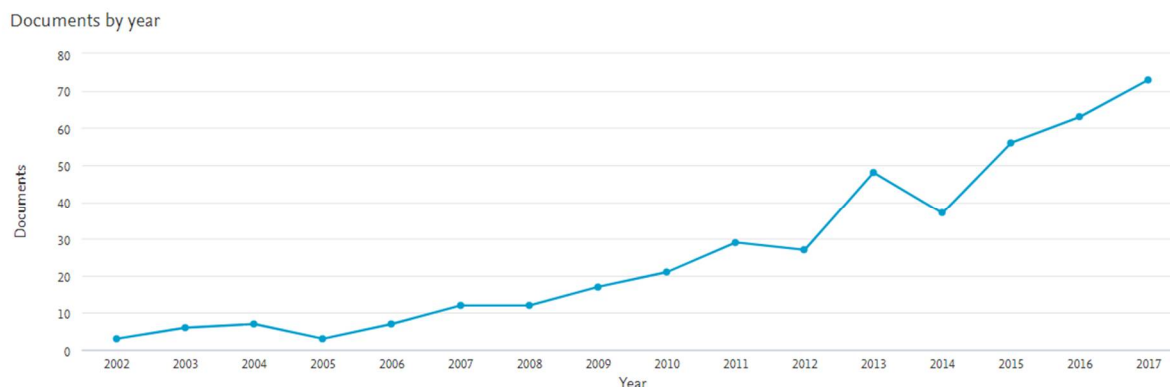
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158   **Figure 2**. Number of publications on sustainable business models from 1999-2018.

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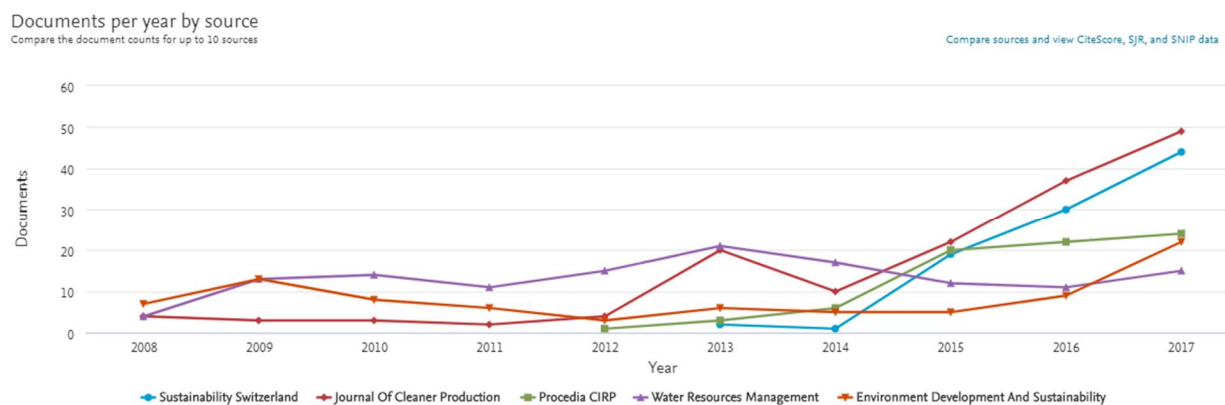
160   The initial database of literature disclosed that the number of publications on sustainable
161   business models, as it is also shown in figure 3, has been increasing year by year. It is diagnosed that
162   the journal of Sustainability, Journal of Cleaner Production, Procedia CIRP, Water Resources
163   Management, Environment Development and Sustainability are the major journals whom have
164   published the results and findings of research on sustainable business models. Figure 3 also clarifies
165   that the number of documents is published in these journals are increasing particularly from 2014
166   onward. Journals of Cleaner Production and Sustainability have had the most share of these trend as
167   they have published the most publications in sustainable business models.

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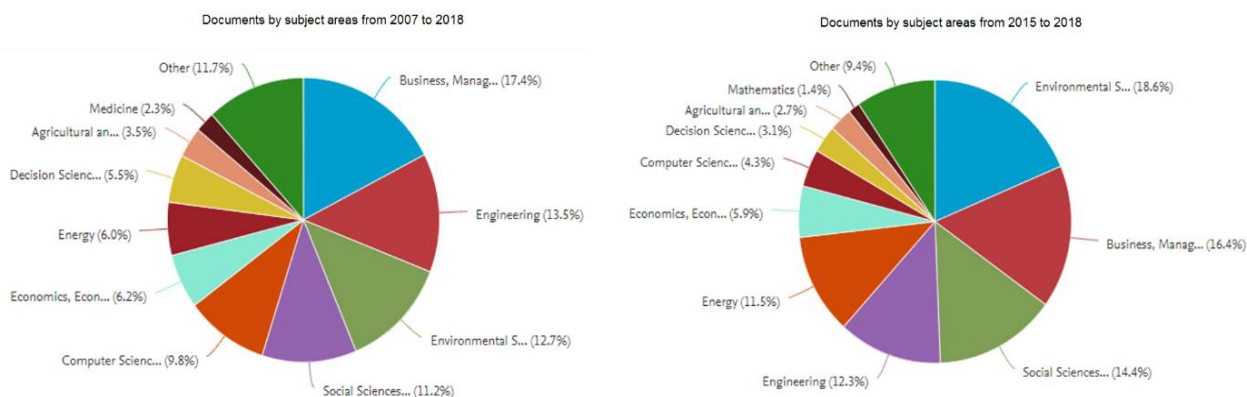
169   **Figure 3.** Number of publications in sustainability business model in different journals.

170   In figure 3, the data related the different subject areas have utilized sustainable business models
171   in their either title, or abstract, or keywords. The pie chart in the left-side refers to the documents are
172   published from 2007 to 2018 and the right-side pie chart refers to the documents published from 2015
173   onward. According to figure 3, 'Business, Management and Accounting (with 17.4%)', 'Engineering
174   (with 13.5%)', 'Environmental Science (with 12.7%)', and 'Social Science (with 11.2%)' are respectively
175   the subject areas have borrowed the concept of sustainable business models and they all together
176   have published more than half (i.e. 54.8%) of the documents. While during last three years, from 2016
177   so far, the focus of these order of subject areas are changed and 'Environmental Science (with 18.6%)',

178   'Business, Management, and Accounting (with 16.4%)', 'Social Science (with 14.4%)', and
179   'Engineering (with 12.3%)' are subject areas have respectively published the most documents related
180   to sustainable business models which is the representation of a considerable shift of literature of
181   sustainable business models on environmental science.

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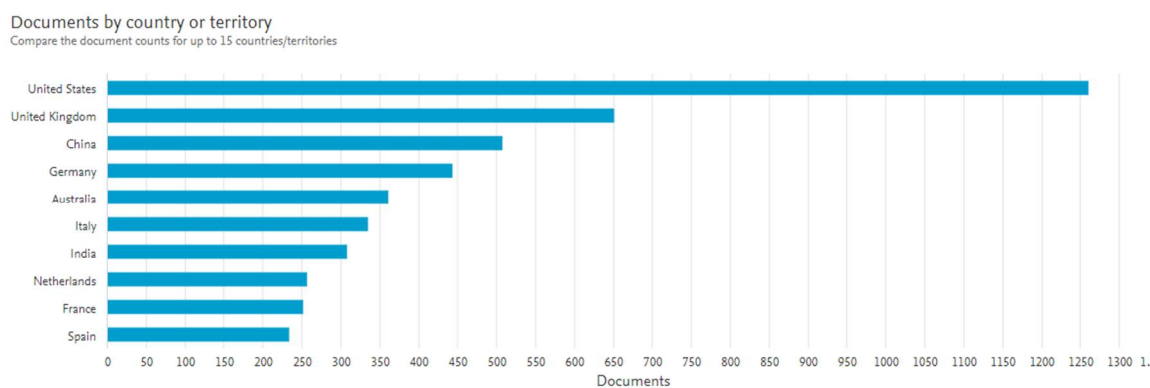
183   **Figure 4.** Application of sustainable busienss model in different subject areas.

184   A precise look at the research on the sustainable business models reveals that the research on
185   sustainable business models is more prevalent in the U.S than other countries. Figure 4 indicates that
186   more than 2500 research related to sustainable business models are dome in the context of the U.S,
187   from 2007 to 2018. The U.K, China, Germany, and Australia are respectively countries in which the
188   research is conducted on sustainable business models.

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190   **Figure 5.** Research on sustainable business models in different countries from 2007 to 2018.

191   Among the documents published in the area of sustainable business model 53.8% of them are
192   original research articles, 29.6% of conference papers, 7.9% book chapter, and 3.7% of them are review
193   articles. As figure 5 represents, original research article is the most common document is published
194   in the area of sustainable business model from 2007 to 2018.

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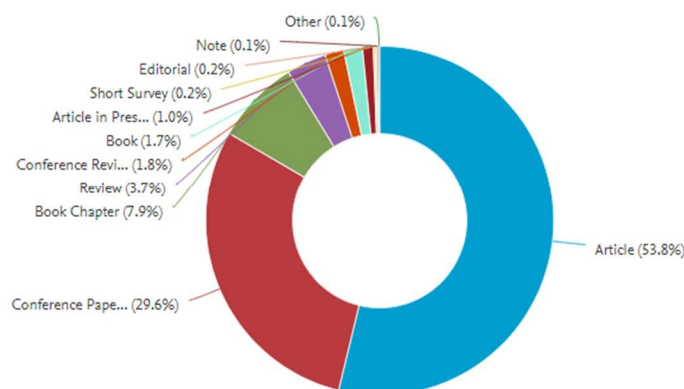

196　　**Figure 6.** Types of documents are published in the area of sustainable business model from 2007 to
197　　2018.

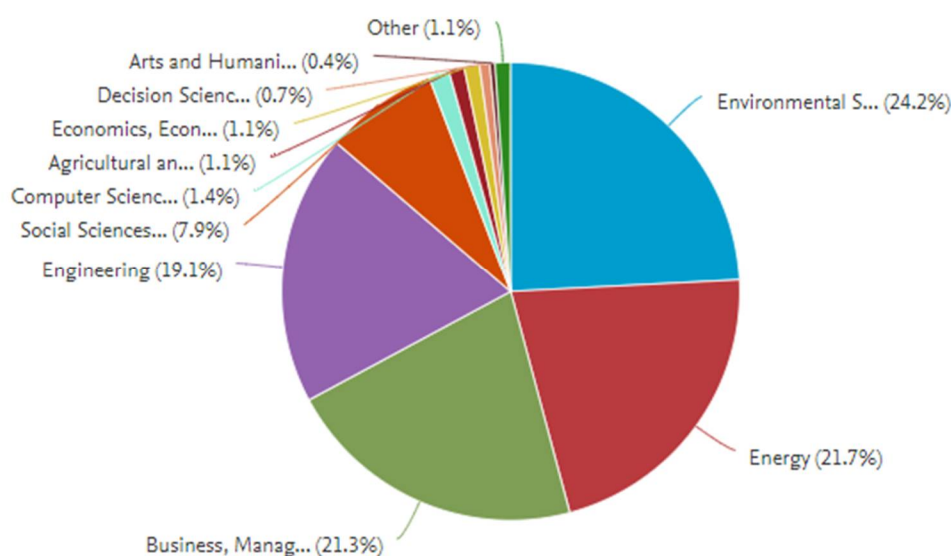
198　　A primary search in the literature of sustainable business models, it is found that 3688
199　documents in 27 different subject areas are published. Table 1 constitutes the detail related to these
200　27 subject areas and the number of articles has published in their area utilizing sustainable business
201　model in their title, or abstract or keywords.

202　　**Table 1.** Application of sustainable business models in different subject areas, based on the primary
203　　search, from 2016 to 2018.

Subject area	No of Documents
Environmental Science	687
Business, Management and Accounting	603
Social Sciences	531
Engineering	454
Energy	425
Economics, Econometrics and Finance	216
Computer Science	158
Decision Sciences	115
Agricultural and Biological Sciences	100
Mathematics	51
Medicine	50
Arts and Humanities	49
Earth and Planetary Sciences	47
Materials Science	38
Chemical Engineering	30
Chemistry	29
Psychology	25
Physics and Astronomy	18
Biochemistry, Genetics and Molecular Biology	17
Multidisciplinary	10
Health Professions	8
Pharmacology, Toxicology and Pharmaceutics	8

Neuroscience	6
Nursing	6
Immunology and Microbiology	3
Veterinary	3
Dentistry	1

204

205   In the section of materials and methods, the data collection and reviewing process has
206   elaborately explained. In the review section, a pic picture of the current research on sustainable
207   business models, firstly, is provided and then the application of sustainable business models in
208   different areas are discussed. In the discussion and conclusion section, the findings are articulated
209   and application in detail and recommendations were presented for organizations and future
210   research.

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212   **Figure 7.** The subject areas of the articles are considered for future analysis in this study.

213   Where Environmental Science, Energy, Business, Management and Accounting, Engineering,
214   and Social Sciences contribute more in number of documents. Nevertheless, the research
215   methodology classifies the literatures into fourteen categories i.e. innovation, management and
216   marketing, entrepreneurship, energy, fashion, healthcare, agri-food, supply chain management,
217   circular economy, developing countries, engineering, construction and real estate, mobility and
218   transportation, and hospitality. Figure 8 illustrates this classification.
219   Sustainable business models leverage the firms to integrate their economic objectives with their
220   sustainability ambitions in such a way the benefits of all the stakeholders achieve simultaneously
221   [20]. Porter and Kramer [21] argue that sustainable business models are sources of competitive
222   advantage in which incorporating sustainable value proposition, value creation and value capturing
223   mechanisms bear economic benefits to the companies. Boons and Lüdeke-Freund [11] count four
224   main characteristics of a sustainable business models distinguishing it from a conventional business
225   model. They believe that the value proposition of sustainable business models is an ecological or
226   social value in accordance with economic value. In the supply chain of sustainable business models
227   suppliers feel responsibility towards the focal company's stakeholders as well. The sustainable
228   business models encourage the sustainable consumption. Ultimately, Boons and Lüdeke-Freund [11]
229   express that in design of the financial model of the sustainable business models, addition to the
230   economic benefits, the company's ecological and social impacts are also considered. Abdelkafi &

231 Täuscher [22] define s as tools incorporating sustainability in the firms' value proposition and value
232 creation logic. Per se, sustainable business models not only provide value to their customer, but also
233 to the natural environment and society. Geissdoerfer, Bocken, and Hultink [23] consider sustainable
234 business models as a set of the elements in which the interrelation between these elements and their
235 interactions with the stakeholders create, deliver, capture, and exchange sustainable value for its
236 multi-stakeholders.
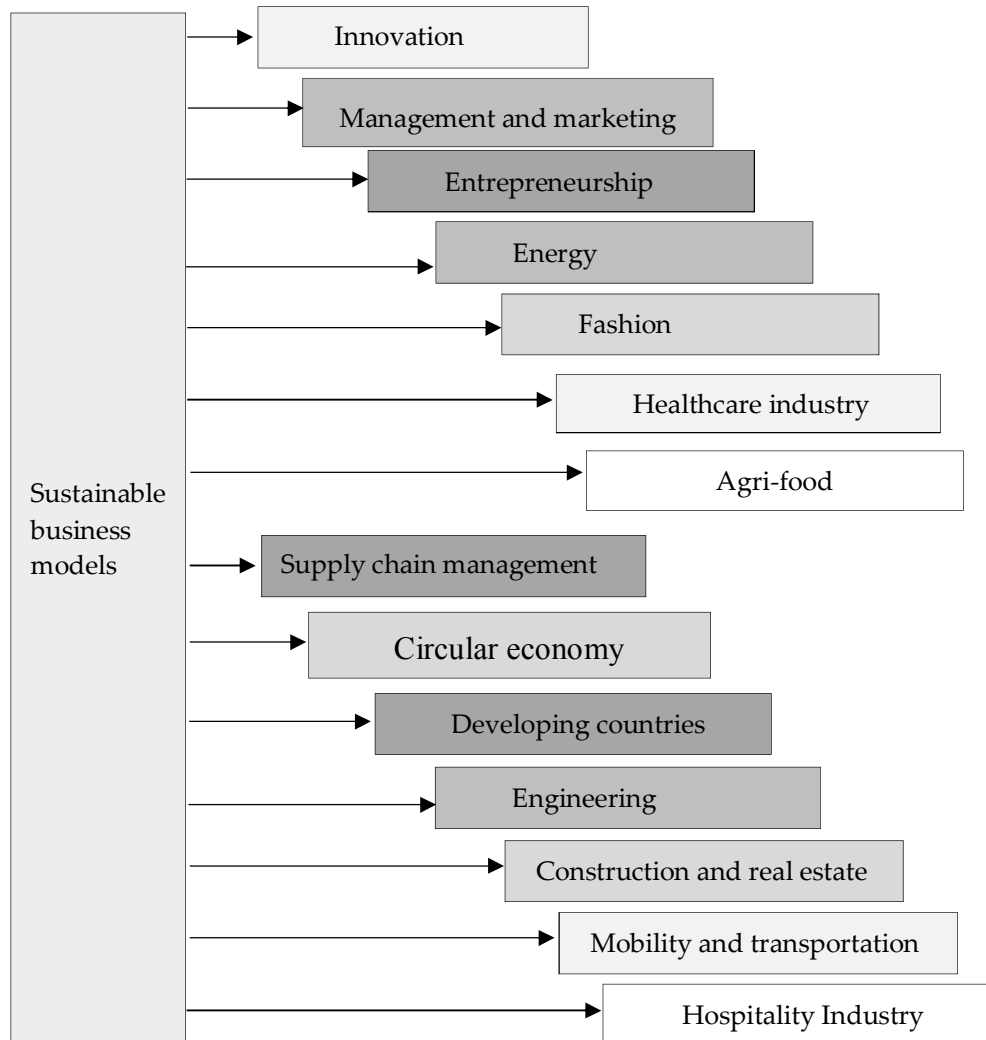
Figure 8. Taxonomy of application categories of sustainable business models

270   Businesses with different characteristics from different industries are aided by sustainable
271 business models to achieve their sustainability ambitious. Besides, many researchers have
272 incorporated this concept with the other concepts to provide possible solutions for the businesses for
273 sustainable development. Further this section articulates in detailed how sustainable business models
274 are applied in the specific categories of innovation, management and marketing, entrepreneurship,
275 energy, fashion industry, healthcare industry, agri-food, supply chain management, circular
276 economy, developing countries, construction and engineering, hospitality industry.

278   *3.1. Innovation*

279   Much research has conducted on the common fields on innovation and which mainly strive to
280   propose models, frameworks, or guidelines to elaborate how to innovate a sustainable business
281   model or how to shift a traditional business model to a sustainable business model. Evans *et al.* [15]
282   provide five paradigms for such transformation toward a sustainable business model.

283   Evans *et al.* [15] articulate that the firs approach to design a sustainable business model is to
284   design sustainable value that incorporates economic, social and environmental benefits
285   conceptualized as value forms. According to Evans *et al.* [15], the second way to design a sustainable
286   business model is to create a system of sustainable value flows among multiple stakeholders,
287   including the natural environment and society as primary stakeholders. Generating a value network
288   with a new purpose, design and governance is the third path toward a sustainable business model.
289   The fourth paradigm to have a sustainable business model is to consider systemically the stakeholder
290   interests and responsibilities for mutual value creation. Finally, internalizing externalities through
291   Product Service System also enables innovation towards sustainable business models.

292   Geissdoerfer, Bocken and Hultink [24], inspired by design thinking, developed the concept of
293   'Value Ideation' comprising value ideation, value opportunity selection, and value proposition
294   prototyping. Based on the first principle of Evans *et al.* [15] model, the approach of Geissdoerfer *et al.*
295   [24] to design e a   is to design a sustainable value proposition in which additional forms of value are
296   created through identifying formerly underserved stakeholders (including society and environment)
297   in the value proposition.

298   Likewise, "Value Triangle" is a new framework to design that is proposed by Biloslavo, Bagnoli
299   and Edgar [25] . The VT is a tool allows a firm to capture economic value from a circular value system
300   in which the value is co-created and co-delivered through the collaboration of the firm with its
301   stakeholders. In other words, the value generated in value triangle is able to meet the benefits of
302   customers (customer value), partners and suppliers (partner value), social actors including
303   environment and future generation (i.e. public value), and the firm itself (captured value).

304   Oskam, Bossink, and de Man [26] propose the concept 'value shaping' for sustainability-
305   oriented innovations that is able to clarify all the types of financial, social and environmental value
306   that a business create by interacting with the different networks. They outline that depends on the
307   place of the business model in the life cycle curve, different networks assist the business to design the
308   value. Exploring value refers to the value the firm explores through the existing network and the
309   social network of entrepreneurs. Developing value point out the firms shape their value proposition
310   through engagement of the potential customers. Reframing value refers is the stage in which the
311   feedbacks from the real customers are utilized to refine the delivered value. Finally, Oskam *et al.* [26]
312   argue that redirecting value refers to shifting from the current value to other value/values due to
313   change in mind-set of the firms; or redirecting value from the direct customers towards the end clients
314   of the products.

315   Joyce and Paquin [27]   provide a novel approach to design a sustainable business model. They
316   propose a Triple Layered Business Model Canvas to meet the economic, social, and environmental
317   benefits in which these three layers respectively explain how the value creation and delivering
318   process satisfy the benefits of the business, society and the environment.

319   Roman, Liu, and Nyberg   [28] propose a three-step approach to design a sustainable business
320   model for transforming toward open access databases in which research data created from university

321 are accessible to industry for facilitating the open innovation process. Their model comprises three
322 stages of identifying the possible opportunities, recognizing the barriers, and finally designing the
323 model.

324 **Table 2.** Application of Sustainable business models in the innovation.

Author/s	Year	Contribution	Methodology	Data Source
Evans et al [15]	2017	Framework	Qualitative	Literature synthesis
Geissdoerfer, Bocken and Hultink [24]	2016	Framework	Qualitative	Literature synthesis, expert interviews, and multiple workshops
Biloslavo, Bagnoli and Edgar [25]	2018	Framework	Qualitative	Systematic literature review, case study
Oskam, Bossink, and de Man [26]	2018	Framework	Qualitative	Case study, interview, secondary data
Joyce and Paquin [27]	2016	Framework	Qualitative	Literature synthesis, secondary data
Roman, Liu, and Nyberg [28]	2016	Framework	Qualitative	Case study, interview

325

326 *3.2. Management and Marketing*

327   Business models have been considered as tools to implement the business strategies. Therefore,
328 it makes sense that the goals of the business models should be aligned with the organizations' goals.
329 Research has proved that designing a business model which can provide sustainability to the society,
330 environment and the business itself requires a prerequisite: providing sustainable values to the
331 society and the environment should be considered in the purpose of the organization, at first.
332   Stubbs [29] by studying the characteristics the sustainable business models of B Corporations
333 illustrates that social and environmental concerns are embedded in the mission and purpose of B
334 Corporations and the main goal of such corporations is to create positive societal impacts for its
335 stakeholders. He realized that such thinking affected the value propositions, value creation and value
336 delivering of B corporations and the B Corps align their profit and societal impact. It is worth
337 mentioning that businesses can be certified as B Corps that they have had the highest performance in
338 social and environmental standards, public transparency, and legal accountability.
339   Morioka, Bolis, Evans, and Carvalho [30] conducted a multiple case studies in eleven
340 organizations from diverse sectors, situated in Brazil and in the United Kingdom. They realized that
341 to integrate sustainability into sustainable business model's value creation and delivery system, the
342 organizations should firstly, make a connection between business purpose and employees' values
343 and believes, then they should be pro-active and clear engagement in solving sustainability problems.
344   In addition to aligning the goal of business model with the business's itself, the rule of decision
345 makers in implementing a business model should not be neglected. Kurucz, Colbert, Lüdeke-Freund,
346 Upward, and Willard [31] explain that how relational leadership advance the design and
347 assessment of sustainable business models. According to Kurucz *et al.* [31], relational leadership
348 processes that support strongly sustainable organization management help organizations to address
349 effectively the existing constraints and also to avoid contributing to the tightening of future limits of
350 the biosphere. They articulate that by engaging relational leadership in strongly sustainable business
351 model canvas (SSBMC) and the future-fit business benchmark (f2b2) organizations can define and
352 strive for their sustainability goals. Upward and jones (2016) argue that the strongly sustainable

business model canvas demonstrates relational leadership characteristics that support business modelling toward strategic sustainability. Additionally, Kurucz *et al.* [31] explain that the future-fit business benchmark (f2b2) provides a 'fourth benchmark' which defines the ultimate goal of zero negative impact on the socio-ecological system

A business model elucidates how a business makes money through value proposition, value creation and value delivering. The core concept in business model is "value". The value that the customer is ready to pay for it. Most of the marketing activities are dedicated in diagnosing the customers' needs so as for providing such value for them. The next stream of research on the business model sustainability, in the literature, is to engage the final users in the value proposition process. It is one of the approaches ensuring the businesses to consider their benefits and design a sustainable business model.

By studying firms that provide energy efficiency products and services Tolkamp, Huijben, Mourik, Verbong, and Bouwknegt [32] found that utilizing a user-centered approach to design a sustainable business model is the key to success of these firms. He realized that firms engage the customers in designing their business model in form of a four-stage loop including: design of involvement, facilitation of involvement, extraction of lessons learned and finally business model adaptation. In other words, Tolkamp *et al.* [32] claim that identifying and incorporating the customer needs into the firm's value proposition is of utmost importance in designing an effective and sustainable business models.

Baldassarre, Calabretta, Bocken, and Jaskiewicz [33] , aided by principles user-driven innovation, provide practical framework to design a sustainable business model through designing a sustainable value proposition. User-driven innovation present solutions meeting the benefits of society and the business, at the same time through an iterative process in which potential customers are engaged in the design of value proposition.

De Bernardi and Tirabeni [34] perceive that designing a sustainable business model involves designing a community-centered sustainable value proposition. They by combining principles from both sustainable business model innovation and user-driven anti-consumption and well-being habits they intended to design a sustainable business model that enhance sustainable and anti-consumption behaviours. They studied the Italian Food Assembly, which is a successful example in Alternative Food Network (AFN). De Bernardi and Tirabeni [34] found out two main factors have caused Italian Food Assembly implemented a sustainable business model: 1) there is a strong knowledge sharing of sustainable consumption behavior among the members and 2) there is an effective distribution of best practices among them also.

Table 3. Application of Sustainable business models in the management and marketing.

Author/s	Year	Contribution	Methodology	Data Source
Stubbs [29]	2017	Design & Process	Qualitative	Interview
Morioka et al [30]	2018	Framework	Qualitative	Case Study
Kurucz et al. [31]	2017	Conceptual model	Qualitative	Literature synthesis
Tolkamp et al. [32]	2018	Design & Process	Qualitative	Interview
Baldassarre et al. [33]	2017	Framework	Qualitative	Literature synthesis, expert interviews, and multiple workshops

| De Bernardi and Tirabeni [34] | 2018 | Design & Process | Qualitative | Case Study, depth interviews, participant observation, focus groups and document analysis. |

387 *3.3. Entrepreneurship*

388   Davies and Chambers [35] argue that the sustainable entrepreneurs encounter with hybrid
389 tensions when they focus on creating economic value whilst increasing social or environmental value.
390 They argue that conflicts among different value capturing process leads in a business instability, and
391 a business model innovation is the solution to eradicate the conflict. Gasbarro, Rizzi, and Frey [36]
392 provides empirical insights how sustainable entrepreneurs cope with regulative, normative and
393 cultural-cognitive issues to increase institutions' legitimacy by developing a sustainable business
394 model. They articulate that institutional entrepreneurs (SIEs) designing innovative business models
395 by engaging the final customers and strategic partnerships in developing innovative value
396 propositions process to, firstly, increase the benefit of innovative sustainable business models,
397 secondly, to imitate the possible conflicts, and ultimately to change industry norms and social beliefs
398 and cultural-cognitive barriers in a value proposition so as for increase legitimacy within the
399 normative and cultural-cognitive institutions.

400   Khalid, Hassam, and Ahmad [37] consider the entrepreneurial action theory as an alternative
401 to entrepreneurship theory since it has an important role in the sustainable business innovation
402 model. Significant knowledge derived from entrepreneurial action provides a better understanding
403 about how to develop and establish sustainability-innovation ventures. Whilst, Neumeyer and
404 Santos [38] reveal that although the networks of sustainable entrepreneurial ventures are more
405 densely connected in compare to conventional entrepreneurs, sustainable entrepreneurs are
406 underrepresented, in the Southeast United States. [39] also provides empirical evidences that the
407 investors reluctant to invest on the sustainable start-ups, particularly those are environmentally
408 sustainable. On the other hand, de Lange [39] also illustrate that the investors are attracted to
409 invest on the start-ups in the sustainable national context.

410   **Table 4.** Application of Sustainable business models in the entrepreneurship.

Author/s	Year	Contribution	Methodology	Data Source
Davies and Chambers [35]	2018	Theoretical and empirical evidence	Quantitative	Multiple case study, interview
Gasbarro et al. [36]	2018	Empirical evidence	Qualitative	Interviews and archive data
Khalid et al. [37]	2016	Framework	Qualitative	Literature synthesis
Neumeyer and Santos [38]	2018	Empirical evidence	Quantitative	Literature synthesis, interview, secondary data
de Lange [39]	2017	Empirical evidence	Quantitative	Secondary data

411 *3.4. Energy*

412   One of the objectives of sustainable business model is to eliminate (or at least minimize) the
413 harmful effect of the businesses on the environment. Many approaches are provided in the literature
414 for the businesses to reach this sustainable goal. Management of the resource and energy is of utmost
415 importance in meeting the sustainability goals. Moschetti, Brattebø, Skeie, and Lien [40] propose
416 an analytic process based on the execution of quantitative sustainability analyses, to transition from
417 a traditional focus of business models on economic value and customers toward proposing, creating,

418 and capturing sustainable values for the environment and the society. Sousa-Zomer and Cauchick
419 Miguel   [41]   investigate how such sustainable business model can support technological
420 innovations such as decentralized approaches for water quality and quantity improvements in urban
421 areas. Their founding revealed that having a sustainable business model through a close integration
422 with customers improve consumers' acceptance, risk perception, and confidence in decentralized
423 approaches.

424 Zhang, Guo, Gu, and Gu   [42]   propose a framework which assists the decision makers to
425 develop sustainable business models for high energy-consuming equipment (HECE). Aided by
426 Product Service System (PSS), they suggest a decision-making support tool for developing PSS of
427 HECE. In their opinion, in a sustainable business model the benefits of all the stakeholders are
428 considered. The illustrated that extra economic benefits impose more burdens and higher risk to the
429 environment. And developing PSS is not always sustainable as in gas supply service, for instance, it
430 would lead to extra economic and environmental burdens due to frequent transportation.

431 Rossignoli and Lionzo   [43]   provides empirical evidence of new forms of interdependencies
432 arising within partnership networks drive businesses in the energy sector to have a sustainable
433 business model. He believes that a network induces its contributors to expand their definition of
434 value and requires them to create value for both companies and society as the main objective of their
435 business model. According to Rossignoli and Lionzo   [43] , the new links among participants of a
436 network create new approaches for capturing value and assist them to solve the concerns related to
437 the resource dependency, which is achieving sustainability goals.

438 Nichifor   [44]   conducted a research to compare the current sustainable business models of the
439 current firms in the wind and solar energy sector in Romania. She founds that Both sectors have
440 encountered egregious changes in last two years due to the changes in supporting plans that affect
441 renewable energy markets and have developed them. In addition, Nichifer   [44]   found out these
442 supportive plans have attracted investors are a pessimistic outlook of future investments due to legal
443 instability that made them to reduce the wind projects.

444 **Table 5.** Application of Sustainable business models in the energy section.

Author/s	Year	Contribution	Methodology	Data Source
Moschetti et al. [40]	2018	Model	Quantitative	Literature synthesis and case study
Sousa-Zomer and Cauchick Miguel [41]	2018	Design & process	Qualitative	Case study
Zhang et al. [42]	2018	Framework	Qualitative	Literature synthesis and case study
Rossignoli and Lionzo [43]	2018	Empirical evidence	Qualitative	Case study, interview, questionnaire
Nichifer [44]	2015	Empirical evidence	Qualitative	Case study, interview, questionnaire

445 *3.5. Fashion*

446 Pal and Gander   [45]   also believe that the traditional business models in the fashion industry
447 produce highly negative outcomes for the environment through high water usage, chemical
448 pollutions, and incineration or landfill of a large amounts of unsold stock. Ciasullo, Cardinali, and
449 Cosimato   [46]   also claim that the fashion industry is unsustainable as active companies in this
450 industry imposed many economic, social and environmental burdens. Therefore, many tools and
451 approach have emerged to design a sustainable business model for coping with these social and

452 environmental issues in the fashion industry. Kozlowski, Searcy, and Bardecki   [47] , for instance,
453 develop a new design tool, called the reDesign canvas, to assist sustainable designers in the fashion
454 industry. They propose a business model canvas with 12 building blocks ensuring the entrepreneurs
455 to build a sustainable fashion brand. Hirscher, Niinimäki, and Joyner Armstrong   [48]   aiding by
456 social manufacturing theory strived to design a more sustainable innovative value in design and
457 manufacturing of fashion. They use do-it-yourself (DIY), do-it-together (DIT) design strategies in
458 which users turned into the value creators to develop a sustainable business model.

459   Slow fashion is an approach aimed at intensifying sustainability in the fashion industry. Jung
460 and Jin [49]   conducted a research to investigate the profitability this approach in the fashion
461 industry. Customer value creation framework, which is one of the slow fashion solutions, refers to
462 creating perceived customer value. They provide empirical evidence that participating the customers
463 in the value creation process increases their intention to pay a price premium for slow fashion
464 products. Jung and Jin [49]   found out delivering creating customer value for slow fashion positively
465 affects consumers' purchase intentions which can secure an economically sustainable business model,
466 while it continuously ameliorating environmental and social sustainability.

467   Pal and Gander [45]   argue that incongruence of fashion customers' value with the value
468 propositions and the barriers in transition of supply chain toward a slowing and a closing loop of
469 resources are detrimental to developing a sustainable business model in the fashion industry. [45]
470 believe that development of a business model should be considered as a system for creating value for
471 the customer and environmental and capturing value for the firm so that the firms can replace the
472 dominant, unsustainable model with sustainable business models in fashion industry.

473   **Table 6.** Application of Sustainable business models in the fashion industry.

Author/s	Year	Contribution	Methodology	Data Source
Pal and Gander [[45]	2018	Theoretical Evidence	Qualitative	Literature synthesis
Kozlowski *et al.* [[47]	2018	Framework	Qualitative	Literature synthesis, participatory action research (PAR), and interviews
Hirscher *et al.* [[48]	2018	Framework	Qualitative	Literature synthesis, workshop, and interview
Jung and Jin [[49]	2016	Empirical evidence	Quantitative	Questionnaire

474 *3.6. Healthcare Industry*

475   Nikou and Bouwman [[50]   conduct a systematic literature review based on a business model
476 ontology to find the applications of mobile technology and devices in the healthcare industry. Their
477 findings illustrate that in order for Mobile Technology contribute to the design of sustainable business
478 models in the healthcare industry, non-technological business model components such as value
479 proposition, organizing and revenue models should be considered rather than focusing on the service
480 platforms. In other words, to design a sustainable business model in the healthcare industry by
481 utilizing Mobile Technology, value propositions should be designed based on the customer's values
482 to provide social benefits and the value capture processes should be designed to provide economic
483 benefits. Merchant, Ward, and Mueller   [51]   claim that utilizing Telemedicine (also known as
484 telehealth) is a tool that provide sustainability to the hospitals. According to Merchant, Ward, and
485 Mueller   [51] , Telemedicine provides solutions to design value propositions to develop a sustainable
486 business model. Their results disclose that, although, hub hospitals are more responsible for the

487   design of sustainable business models in compare to the spoke hospitals in the U.S., both hub and
488   spoke hospitals pointed out that telemedicine helps them to meet their mission, facilitates access,
489   keeps lower-acuity patients closer to home, and helps head off competition. However, Anwar and
490   Prasad [52] argue that although telemedicine has presented many solutions for developing a
491   sustainable business models in the healthcare industry, adoption to such technology has turned into
492   the utmost importance. Because evolution and sometimes revolution in this technology has made it
493   hard to the users to get used to it. Anwar and Prasad [52] recommend a continuous eHealth
494   literacy so as for, firstly, facilitating the transition era and secondly, the development of new business
495   models in which the users' involvement and motivation and also the revenue generation have been
496   considered. They express that the telemedicine services should be user- friendly and sustainable
497   which are able to integrate all stakeholders' benefits in one system.

498   **Table 7.** Application of Sustainable business models in the healthcare industry.

Author/s	Year	Contribution	Methodology	Data Source
Nikou and Bouwman [50]	2017	Theoretical evidence	Qualitative	Literature synthesis
Merchant, Ward, and Mueller [51]	2015	Theoretical & empirical evidence	Qualitative	Literature synthesis, secondary data, and interviews
Anwar and Prasad [52]	2018	Framework	Quantitative	Literature synthesis

499   *3.7. Agri-food*

500   Research interest in providing sustainable solutions for developing business models in the agri-
501   food sector has increased in these years [53] . Franceschelli, Santoro, and Candelo [54] argue that
502   development of sustainable business model innovation within the food industry, especially for start-
503   ups, is of utmost importance, because the industry is itself linked with nature and human respect.
504   Barth, Ulvenblad, and Ulvenblad [53] by conducting a systematic literature review, proposes a
505   conceptual framework for sustainable business model innovation in the agri-food sector which can
506   meet the challenges encountered in taking a sustainability perspective.

507   Franceschelli *et al.* [54], contribute to the extant research by introducing the concept of
508   sustainable innovation within the business model literature. They utilize business model canvas to
509   design an innovative sustainable business model for food start-ups. Franceschelli *et al.* [54], propose
510   a sustainable business model based on business model canvas by providing sustainable solutions for
511   each component of the business model.

512   Lee and Slocum [55] study the meeting organizers who plans the meetings food and beverage
513   providers. They provide empirical evidences that such meeting organizers have selected to have a
514   sustainable business model by organizing the meetings for the local foods. Although they have a
515   contractual flexibility to select foods, there is a willingness to pay a price-premium for local products.
516   Lee and Slocum [55] also show that the meeting/event attendees have not considered themselves
517   sustainable yet and there is a need to increase the knowledge of and the benefit of local foods (which
518   are organic and harmless for the environment) to enhance the attendees' knowledge about
519   sustainability.

520   Robinson, Cloutier, and Eakin [56] prove that the landscaping enterprises have a sustainable
521   business model, thereby provide multifunctional edible landscapes in the cities, have a greater range
522   of value propositions and revenue streams resulting in increasing their competitive advantage. They

523 express that these enterprises can have the potential value creation of edible landscaping ranged
524 between $3.9 and $66 billion, and that positive return on investment (ROI) could be achieved within
525 one to five years.

526 **Table 8.** Application of Sustainable business models in the agri-food section.

Author/s	Year	Contribution	Methodology	Data Source
Barth et al. [53]	2017	Framework	Qualitative	Systematic literature review
Franceschelli et al. [54]	2018	Theorical Evidences	Qualitative	Case study, secondary data, and interviews
Lee and Slocum [55]	2015	Empirical Evidences	Quantitative	Questionnaire
Robinson et al. [56]	2017	Empirical Evidences	Qualitative	Interview, and GIS landscape analysis

527 *3.8. Supply Chain Management*

528   Supply chain management is another sector has borrowed the concept of sustainability business
529 model as a possible solution to meet sustainable development. The objective of sustainability is to
530 address environmental and socio-economic issues in the long term [57] . Ray and Mondal   [58]
531 provide evidences illustrate that collaboration is better than competition to sustain in the market.
532 They argue that collaboration among firms within a closed-loop supply chain (CLSC) leads in
533 sustainable business model in which the benefits of three bottom line concepts, i.e. protect
534 environment, improve economic performance, and social performance, can be met. Therefore, Ray
535 and Mondal   [58]   propose a collaborative business model and mechanism for collaborative
536 business strategies in a CLSC. Witjes and Lozano [57]   also proved evidences classifying that
537 collaboration is crucial to develop sustainable business models for supply chain management. They
538 believe that collaboration between procurers and suppliers in the procurement process mitigate the
539 use of raw material and waste generation through the development of sustainable business models.
540 Witjes and Lozano [57]   declare in a collaboration business model, suppliers and procurers gain
541 experiences in the collaboration process to improving circular economy objectives contribution and
542 to secure economic benefits for both parties, at the same time.

543   Geissdoerfer, Morioka, de Carvalho, and Evans [59]   inspired by circular business model
544 concept and circular supply chain management concepts strive to design a sustainable framework to
545 provide solutions for sustainable supply chain management. They disclose that circular business
546 model provides different solution for different loops: closing loops, slowing loops, intensifying loops,
547 narrowing loops, and dematerializing loops.

548   Brennan and Tennant [60]   conducted a comparative case study to find out how to resolve
549 trade-offs in sustainable supply chain management. They realized that for transition from a
550 traditional supply network toward sustainable supply network, business model innovation requires
551 to create sustainable values and resolve trade-offs. They illustrate how network-centric business
552 model innovation provides sustainable solutions for the trade-off between economic and
553 environmental benefit through the prioritization of sustainability-related 'cultural' resources.

554

555 **Table 9.** Application of Sustainable business models in the supply chain management.

Author/s	Year	Contribution	Methodology	Data Source
Ray and Mondal [58]	2017	Framework	Qualitative	Systematic literature review
Witjes and Lozano [57]	2016	Theorical Evidences	Qualitative	Literature synthesis
Geissdoerfer *et al.* [59]	2018	Framework	Qualitative	Literature synthesis, case study, interviews
Brennan and Tennant [60]	2018	Empirical Evidences	Qualitative	Case study and Interview

556 *3.9. Circular Economy*

557   Circular economy in the literature, has widely considered as a tool to implement and design a
558 sustainable business model in the different sectors in response to current unsustainable trajectories.
559 As it is shown in the table 9, Witjes and Lozano [57] and Geissdoerfer *et al.* [59] utilized this
560 concept to design a sustainable business model for the area of supply chain management. In this
561 section, will the other articles that have benefited from the Circular Economy for designing a
562 sustainable business model are compiled and submitted.

563   Heyes, Sharmina, Mendoza, Gallego-Schmid, and Azapagic [61] applied the Backcasting and
564 Eco-design for the Circular Economy (BECE) framework to identify how ICT firms diagnose circular
565 business model innovations. BECE is designed for the product-oriented firms that is why Heyes *et al.*
566 [61] , by shifting the focus to a user-centered eco-design, design a circular economy models consistent
567 with the company's priorities of customer satisfaction and profitability.

568   Todeschini, Cortimiglia, Callegaro-de-Menezes, and Ghezzi [62] by synthesizing of the
569 current literature have developed an innovative circular business model in which the value
570 propositions are sustainable and reduce environmental impacts. By conducting eight case studies on
571 innovative fashion startups, they identify the concept of 'born sustainable' which assist the
572 entrepreneurs to design sustainable value propositions to accomplish the circular economy
573 objectives.

574   However, Stål and Corvellec [63] provide empirical evidence, based on seven case studies in
575 Sweden, that businesses pro-actively looking for increase institutional demands for circularity to
576 meet their own economic interests while that companies buffer their business model and their value
577 proposition from emerging demands.

578 **Table 10.** Application of Sustainable business models in the circular economy.

Author/s	Year	Contribution	Methodology	Data Source
Heyes *et al.* [61]	2018	Framework	Qualitative	Literature synthesis, case study, workshop
Todeschini *et al.* [62]	2017	Framework	Qualitative	Literature synthesis, case study, interviews
Stål and Corvellec [63]	2018	Empirical Evidences	Qualitative	Literature synthesis, case study, interview

579 *3.10. Developing Countries*

580   Research conducted on sustainable business models in develop countries mainly address bottom
581 of the pyramid (BOP) context, where there are paucity of resources and population suffer from
582 poverty. Bottom of pyramid refers to the global poor who are in extreme poverty and are unable to
583 meet basic needs [64] , most of whom live in the developing countries. According to the World Bank

584 reports, 2.7 billion, which are around half the global population, have less than $2 a day income [64]
585 . In the literature, sustainable business models or so called sustainable business models are consider
586 as tools to create values for both business and society. Designing a market-oriented business model
587 has been widely recommended for providing win-win solutions for multiple stakeholders.

588 Bittencourt Marconatto, Barin-Cruz, Pozzebon, and Poitras [65] provide evidences
589 illustrating the Brazilian government facilitates transition toward sustainable business model by
590 providing strategic and shared value opportunies. By study the Ecoelce project, they articulate how
591 to design a sustainable business model in the BOP context of Northeastern Brazil. Dembek, York, and
592 Singh [66] provide nine individual business models addressing poverty through studying 55
593 organizations in Indonesia and the Philippines. They create a BoP business model matrix to elaborate
594 how the identified business models create, offer, and capture value to benefit different stakeholders.
595 Goyal, Sergi, and Kapoor [67] provide strategic solution for the social enterprises to develop a
596 sustainable business model which can meet the underserved needs of the BoP segment in India. They
597 propose a practical framework for creating a sustainable, scalable and socially relevant ecosystem.
598 Palomares-Aguirre, Barnett, Layrisse, and Husted [68] study business models of three firms that
599 provide affordable housing for very poor people in Mexico. Their finding reveals that community
600 engagement and government collaboration are very important in creating and delivering a
601 sustainable value so as to better serve the BoP.

602 **Table 11.** Application of Sustainable business models in the developing countries.

Author/s	Year	Contribution	Methodology	Data Source
Bittencourt Marconatto *et al.* [65]	2016	Empirical Evidences	Qualitative	Case stud, observations, interviews and secondary data
Dembek *et al.* [66]	2018	Framework	Qualitative	Primary and secondary data
Goyal *et al.* [67]	2017	Framework	Qualitative	Interviews and secondary data
Palomares-Aguirre *et al.* [68]	2018	Empirical Evidences	Qualitative	Literature synthesis, case study, interview

603 *3.11. Engineering*

604 Construction, the biggest industry in the developed world, has greatest environmental impact
605 [69] as well as economic and social consequences [40] . However, Selberherr [70] claim that
606 sustainable buildings bear many potential benefits for service providers and the society. Selberherr
607 [70] proposes strategies for the players in the construction sector to proactively contribute to
608 sustainable development of the society. She recommends that to design a sustainable business model
609 which is aimed at cooperatively optimizing buildings and infrastructures and taking the
610 responsibility for the operating phase via guarantees.

611 Wasiluk [71] provide empirical evidences that businesses in lieu of from justifying the
612 business case for sustainability they should concentrate on understanding how to mobilize their
613 intellectual capital to enhance an ecological sustainable and socially equitable enterprise. Indeed, she
614 considers the intellectual capital as a mediator sophisticating sustainable value proposition for the
615 Australian property and construction sector.

616 Boo, Dallamaggiore, Dunphy, and Morrissey [69] argue that there are approximately 190
617 million buildings in Europe which were built before energy efficiency was a common issue in
618 construction. They consider innovative business models (IBM) as a solution to provide sustainability

619   in the energy efficient building market. Boo, Dallamaggiore, Dunphy, and Morrissey   [69]   propose
620   sustainable business models ensuring long- lasting change in the energy efficient building market.
621   They believe that the co-evolution of business models with both the wider energy system and the
622   natural environment is crucial for the development of a sustainable business model.

623   **Table 12.** Application of Sustainable business models in the construction and engineering.

Author/s	Year	Contribution	Methodology	Data Source
Selberherr [70]	2015	Theoretical Evidences	Qualitative	Literature synthesis
Wasiluk [71]	2013	Empirical Evidences	Qualitative	Case study, interview
Boo *et al.* [69]	2016	Framework	Qualitative	Literature synthesis

624

625   *3.12. Construction and real estate*

626   Rajakallio, Ristimäki, Andelin, and Junnila   [72]   believe that the business model of the firms that
627   are active in the real estate and construction sector are tied with one another as these should be seen
628   as a network creating and delivering value to their client. Besides, they argue that to construct
629   sustainably the real estates, the clients play a vital role as the actual users of the buildings are often
630   tenants who appraise the quality of the real estates. They also debate that the buildings have been
631   traded in the investment markets, where the value is evaluated by the investor. Therefore, they
632   recommend a joint alignment of design themes in which are the stakeholders have the ability to
633   maximize their own private benefits. Whilst, this finding is in contrast with the findings of Bos-de
634   Vos, Volker, and Wamelink   [73]   who realized that engaging the final users in the value creation
635   step and the designing stage reduces the bargaining power of the firms which will finally lead in a
636   reduction in their economic benefits.
637   Rivière, Verges, Dimou, and Garde   [74]   investigate how they can design a network business model
638   for Beauséjour sustainable town project which is a project to build a tropical sustainable city in
639   Reunion Island - a small French island located in the Indian Ocean. The main challenge of the tropical
640   sustainable city is to cope with classic urban issues, environmental concerns and advocacy planning,
641   simultaneously. They were looking for a network business model that can explain how interaction
642   among the developer-contractor, real-estate developers (housing and services sector) and assets and
643   properties management enable them to build a sustainable tropical sustainable city. Their finding
644   reveals that in order for designing a sustainable business model, mix environmental issues with the
645   urban project objectives. Rivière *et al.*   [74]   argue that the urban objectives should be translated into
646   an environmental and bioclimatic sensitive design. Furthermore, the advocacy planning will allow
647   the inhabitants to take care of the plant heritage and contribute to the project.
648   The sharing economy, which is one of the principles of the circular economy, is a solution to reach
649   sustainability. Coworking spaces are also resulted from the concept of sharing economy. Waters-
650   Lynch and Potts   [75]   believe that the research on coworking spaces is disclosing differentiated
651   product niches in the urban office rental market. Waters-Lynch and Potts   [75]   provide a model
652   considering coworking spaces as 'social economy Schelling points' within the evolving landscape of
653   new spaces for urban production. According to the proposed model of Waters-Lynch and Potts   [75]

654   , the coworking spaces entrepreneurially establish focal points for tacit coordination between niche

655   actors who expect to find each other at such locations to cooperate on joint projects.

656   According to Yan, Wang, Quan, Wu, and Zhao [76] urban sustainable development efficiency

657   (USDE) explains how the efficient an urban system is in meeting the human welfare and resources

658   and the environmental input. Yan *et al.* [76] present a framework to evaluate the performance of

659   urban sustainable development in utilizing natural resource limitations and meeting human welfare

660   needs. Their model constitutes 11 specific indicators including water consumption, area of

661   construction land, fossil energy consumption, life expectancy, government spending on education,

662   living area, Engel's coefficient, percent of GDP contributed to others, green land area, days of fairly

663   good air quality, sewage discharge.

664   Song [77] explains all the three main pillars of a sustainable business model (i.e. economic,

665   environmental, and social benefits) for urban sustainable development. Song [77] presents a

666   theoretical background on how to set up an eco-city for urban sustainable development. He argues

667   that resource consumption is a very important element for sustainable development of the eco-cities.

668   Song [77] claims that resource-saving and environment-friendly industries, and reduce resource

669   consumption, reduce unit GDP resource consumption are the main pillars in the ecological city

670   construction. Song [77] also debates that the construction of eco-cities, should be socially

671   sustainable in order to reach the sustainable development objectives of urban areas. He believes that

672   the objective of eco-cities is not only to protect the contemporary human rights, but also to ensure the

673   development of human rights for the next generations. In the case of eco-cities, economic

674   development includes the development of ecological agriculture, industry and services. Eco-

675   efficiency and ecological benefits of economic development are very important in the construction of

676   eco-city [77].

677   As mentioned above, the main objective of sustainable business models is to provide win-win

678   solutions to meet the economic, social and environmental benefits at the same time. The aim of the

679   study of Li *et al.* [78] was to develop indicators and an assessment method by which evaluate the

680   status of urban sustainable development. They developed a system of 52 indicators of urban

681   sustainable development that address economic growth and efficiency, ecological and infrastructural

682   construction, environmental protection, social and welfare progress. Li *et al.* [78] also developed a

683   Full Permutation Polygon Synthetic Indicator method for evaluation of the capacity for urban

684   sustainable development at different times for the next two decades.

685   Many approaches have proposed in the literature for developing sustainable constructions, the

686   constructions are both eco and socio friendly. While determining the economic value of such

687   constructions is of utmost important. Zavadskas *et al.* [79] developed a neutrosophic Multi-

688   Attribute Market Value Assessment (MAMVA) method to determine the real market value of

689   property incorporating sustainability aspects. The MAMVA by utilizing the multiple criteria analysis

690   evaluates sustainable buildings considering the vagueness aspects of the initial information. They

691   argue that this method can assist property sellers, brokers, buyers, and lenders on regional, national

692   and global levels also.

693

694   **Table 13**. **Application of Sustainable business models in the construction and real estate.**

Source	year	Contribution	Methodology	Data Source
Rajakallio *et al.* [72]	2017	Empirical Evidences	Qualitative	Literature synthesis, case study, interviews
Rivière [74]	2013	Empirical Evidences	Qualitative	Case study
Waters-Lynch and Potts [75]	2017	Empirical and Theoretical Evidences	Qualitative	Primary Ethnography data
Yan et al. [76]	2018	Framework	Quantitative	Literature synthesis and Secondary data
Song [77]	2011	Theoretical Evidences	Qualitative	Literature synthesis
Li et al. [78]	2009	Framework and Empirical Evidences	Qualitative	Literature synthesis, Case study and secondary date
Zavadskas [79]	2017	Framework and Empirical Evidences	Quantitative	Literature synthesis, Case study

695

696   *3.13. Mobility and transportation*

697   One of the most important challenges toward global sustainable development is Urban
698   transformation as mobility sector has a great potential to reduce the carbon emission   [80] . The
699   disruptive business model innovation emerged app-based smart-sharing systems such as car-
700   pooling, expanded electric vehicle use, and bike-sharing. Such sharing mobility business models plus
701   low-carbon transport modes in cities, are able to lead urban mobility toward sustainability.   Ma,
702   Rong, Mangalagiu Thornton, and Zhu   [80]   study the relationship between the social-ecological
703   innovation in the sharing economy and the urban sustainable development. Conducting three
704   business cases in the emerging sharing mobility sector –ride-sharing, EV-sharing and bike-sharing -
705   in Shanghai, China, illustrate that there is a strong co-evolution mechanism between the transition
706   towards sustainable city and the business ecosystem innovation towards greener and smarter
707   transport. Ma *et al.*   [80]   believe that the disruptive innovation of the sharing economy is the
708   common area linking this interaction.

709   Mozos-Blanco, Pozo-Menéndez, Arce-Ruiz, and Baucells-Aletà   [81]   analyze the effectiveness of
710   Sustainable Urban Mobility Plans (SUMPs) in 38 of the Spanish Network of Smart Cities, in 2018. The
711   sharing economy principles, which is one of the approaches of implementation of circular economy,
712   is the main criteria has considered in the SUMPs in the Spanish Network of Smart Cities. Their finding
713   discloses that although the most of mobility plans tend to improve the pedestrian and cycling
714   mobility, but there is a need to provide the required software and hardware infrastructures. Car-
715   pooling or car-sharing does not have any remarkable share in transportation in Spain, therefore
716   parking regulation is another criterion has emerged in SUMPs to restrict the presence of parking areas
717   around office buildings and residential areas. Mozos-Blanco *et al.*   [81]   argue that the criterion
718   which has considered in SUMPs to meet the social and environmental benefits objectives, which are
719   of the principles of implementation of sustainable business model in urban development, are the
720   reduction of air and noise pollution and stablishing urban green spaces.

721   Lyons [82] provides theoretical evidences about smart urban mobility and they believe that the
722   terms of smart and sustainable are strongly tied with each other. Lyons [82] argues that for
723   development of smart cities only technological development is not adequate, but also there is a need
724   for sociotechnical development to reach the smart urban mobility. He also believes that the
725   appreciation of people's lifestyles, constraints, needs, desires and behaviors as well as the practices
726   of businesses are of the main requirements of achieving the smart urban mobility objectives. In
727   addition, Lyons [82] debates that ICT plays a vital role in supporting how society connects and it
728   can determine address effectiveness and attractiveness of mobility for the user.

729   Nowickaa [83] believes that sustainable mobility integrates realization of the needs of
730   stakeholders by using remote access to the properties of desired goods and services. From his point
731   of view, utilizing the cloud computing model in mobility lead to achieve the sustainable mobility:
732   minimize the negative impact on the environment, increase the social and economic benefits.
733   Nowickaa [83] argues that the use of cloud computing models reduces the total cost of provided
734   services for residents; provides agility, flexibility, and elasticity; quick and cost-efficient reaction to
735   less-predictable events and changing stakeholders' requirements; globally accessible services, easy
736   and fast implementation and strong support for sustainable development.

737   Köse *et al.* [84] believe that sustainable manufacturing provides competitive advantages to the
738   companies and despites the pressure of stakeholders such as customers, investors, competitors,
739   interest groups and local municipals, companies voluntarily overcomply with social and
740   environmental norms to take advantage of being sustainable. Köse *et al.* [84] , by studying the
741   incentives in the urban mobility to apply sustainable approaches, disclose that the common
742   incentives and strategies of overcompliance and sustainability drives public and private initiatives
743   toward a sharing economy. They realize that the companies design their strategies under the effects
744   of overcompliance with social and environmental aspects to improve sustainability. Köse *et al.* [84]
745   suggest that differentiating existing product lines in favor of sustainability (e.g. electric cars, bamboo
746   bicycles) or by introducing new products that can offer even higher sustainability (e.g. the SUW) can
747   be the possible strategies for the manufacturing industry to overcompliance with social and
748   environmental requirements

749   Zawieska and Pieriegud [85] consider smart cities and the sustainable transportation particularly
750   with regard to the reduction of CO2 emissions. They believe that meeting the reduction targets set by
751   the European Union 2011 White Paper on Transport will be very challenging and it is needed for a
752   profound transformation of transport and energy sectors. Zawieska and Pieriegud [85] also
753   believe that the smart city solutions can mitigate transport CO2 emissions and meet the reduction
754   goals.

755

756   **Table 14.** Application of Sustainable business models in the Mobility.

Source	year	Contribution	Methodology	Data Source
Ma *et al.* [80]	2018	Empirical Evidences	Qualitative	Literature synthesis, case study, secondary data, interviews, surveys, stakeholder workshops
Mozos-Blanco *et al.* [81]	2018	Empirical Evidences	Qualitative	Case study, secondary data
Lyons [82]	2016	Theoretical Evidences	Qualitative	Literature synthesis
Nowickaa [83]	2016	Theoretical Evidences	Qualitative	Literature synthesis
Köse *et al.* [84]	2016	Theoretical Evidences	Qualitative	Literature synthesis and secondary data
Zawieska and Pieriegud [85]	2018	Empirical Evidences	Qualitative	Literature synthesis, Case study and primary date

757

758   *3.14.   Hospitality Industry*

759   Hotels are counted one the most important sectors of hospitality industry which have affected
760   by sustainability movement. The research is done in the common field of business model
761   sustainability and hotels are still in the infancy stage. Qua most of the studies have tried to investigate
762   the sustainability level of the hotels rather than providing solutions for development of a sustainable
763   business model.

764   Buffa, Franch, and Rizio   [86] , utilizing a quantitative approach, provide empirical evidences
765   that medium-sized hotel enterprises (SMHEs) in Trentino, a traditional tourist destination in the
766   Italian Alpine Arc, apply sustainable business models. They argue that these SMHEs adopted three
767   different sets of environmental management practices (EMPs) to accomplish their sustainability goals
768   of their business models.

769   Høgevold, Svensson, Padin, and Dos Santos   [87]   compare the different between sustainable
770   business models in manufacturing companies and hotels as a service sector. They believe that the
771   nature of the industries is very effective in the models they have selected to meet the sustainability
772   objectives. Tangibility and intangibility of the products and services influence the assessmentability
773   of the social and environmental impact of their economic activities.

774   Results of the research of Melissen, Cavagnaro, Damen, and Düweke   [88]   disclose that the
775   current business models of hotel industry are not able to meet the sustainability objectives, especially
776   with respect to addressing guests' needs and wants and (subsequent) institutionalization of
777   sustainability. Nonetheless, they argue that managers' willingness and capabilities are potentially the
778   sources stimulating them to transit toward a sustainable business model.

779   Høgevold and Svensson   [89]   develop a sustainable business model for the hotels based on a
780   case study they have conducted among a major Scandinavian hotel chain known for having
781   implemented sustainable business practices within the company and in its business network. They
782   are the only study that have provided sustainable solutions for different element of business model
783   in which the benefits of multi-stakeholders have considered in value creating and capturing
784   processes.

785

786   **Table 15.** Application of Sustainable business models in the hospitality industry.

Author/s	Years	Contribution	Methodology	Data Source
Buffa et al. [86]	2018	Empirical Evidences	Quantitative	Questionnaire
Høgevold et al. [87]	2016	Empirical Evidences	Qualitative	Case study, secondary data, company records, internet information, interviews and on-site observations.
Melissen et al. [88]	2016	Empirical Evidences	Qualitative	Literature synthesis, Interviews
Høgevold and Svensson [89]	2015	Empirical Evidences	Qualitative	Case study, secondary data, company records, internet information, interviews and on-site observations.

787   **4. Discussion**

788   This study provides a comprehensive review on the applications of sustainable business models
789   in different industries, sectors, and research area. Energy, fashion, healthcare, food, construction and
790   hospitality are industries have resorted to the principles of sustainable business models for
791   realization of sustainable development. Entrepreneurship, management and marketing, innovation,
792   circular economy, and supply chain management are research areas have utilized sustainable
793   business models to provide solutions to achieve their sustainability ambitious. Application of
794   sustainable business models in the developing countries is another category has emerged in the initial
795   screening phase of the literature.

796   Finding reveals that circular business models, base of the pyramid, product service systems, are
797   the major strategies have considered in the literature to design sustainable business models that is
798   quite consistent with the findings of Bocken et al.   [14] . Many authors consider designing a
799   sustainable value proposition as an approach to design a sustainable business model. In this regard,
800   Geissdoerfer et al.   [24] , Biloslavo et al.   [25] , Oskam et al.   [26] , Tolkamp et al.   [32] , Baldassarre
801   et al.   [33] , De Bernardi and Tirabeni   [34] , and Hirscher et al.   [48]   have presented innovative
802   approaches in which customers are engaged in the designing process to devise a sustainable value
803   proposition.   Hirscher et al.   [48] , for instance, utilize do-it-yourself (DIY) and do-it-together (DIT)
804   design strategies to design a more sustainable innovative value proposition. Geissdoerfer et al.   [24]
805   , inspired by design thinking, developed the concept of value ideation to design a sustainable value
806   proposition comprising additional values all stakeholders (including society and environment) in the
807   value proposition. Oskam et al.   [26]   propose the concept value shaping to develop financial, social
808   and environmental value that a business create by interacting with the different networks.

809   Studying the role of managers in designing sustainable business models is a topic has considered
810   in the common area of literature of business and management and business model sustainability.
811   Kurucz et al.   [31]   debate that relational leadership processes that support strongly sustainable
812   organization management help organizations to meet their sustainability ambitious. On the other
813   hand, Stubbs   [29]   believe that those organizations have embedded the social and environmental
814   concerns in their mission and their purpose have been successful in achieving their sustainable
815   business model goals.

816   The main issue emerged in the application of sustainable business models in entrepreneurship
817   is that despite there is a remarkable demand on the sustainable businesses, sustainable entrepreneurs
818   are underrepresented   [39]   and the investors reluctant to invest on the sustainable start-ups,

819   particularly those are environmentally sustainable [39] . Whilst, Davies and Chambers [35] and
820   Gasbarro *et al.* [36] consider business model sustainability innovation as the solution to conquer
821   the barriers to implementing an sustainable business model.

822   Much research is conducted on developing solutions for sustainable business models to manage
823   the resource and the energy as Moschetti *et al.* [40] , Sousa-Zomer and Cauchick Miguel [41] , and
824   Zhang *et al.* [42] propose frameworks and approaches to develop sustainable business models
825   provide values to the energy resources. Rossignoli and Lionzo [43] also recommend partnership
826   networks is a solution that assisting businesses in the energy to provide sustainable value
827   propositions.

828   Pal and Gander [45] also believe that the traditional business models in the fashion industry
829   produce highly negative outcomes for the environment through high water usage, chemical
830   pollutions, and incineration or landfill of a large amounts of unsold stock. Therefore, sustainable
831   business models are considered as a solution to minimize such negative effects. The most prevalent
832   approach in designing a sustainable business model in the fashion industry is to participating the
833   customers in the value creation process [48],[49] . On the other hand, Pal and Gander [45] believe
834   that creating value for the customer and environmental and capturing value for the firm is the
835   solution to eliminate the barriers in transition of traditional supply chain toward a slowing and a
836   closing loop of resources and toward a sustainable business model in the fashion industry.

837   The healthcare is another industry utilizes sustainable business models to achieve sustainability
838   goals. Surprisingly enough, the found articles have used sustainable business models to address
839   sustainability issues have aided digital technologies. In other words, the common literature of
840   business model sustainability and healthcare are tied with digital technology. As Merchant *et al.* [51]
841   and Anwar and Prasad [52] consider Telemedicine as a solution to design value propositions to
842   develop a sustainable business model in healthcare industry. In addition, Nikou and Bouwman [50]
843   believe that utilizing the mobile technology can design a sustainable business model in the healthcare
844   industry.

845   The supply chain sector is the other sector that is found in the literature which has utilized the
846   principles of the sustainable business model to provide solutions to reach the sustainability
847   development [57] . Ray & Mondal [58] , Geissdoerfer *et al.* [59] , and Brennan and Tennant [60]
848   argue that collaboration and networks among firms within a closed-loop supply chain (CLSC) leads
849   in sustainable business model in providing benefits to three bottom line concepts of protect
850   environment, improve economic performance, and social performance. Since it the supply chain
851   concept implies B2B relationships between the suppliers and buyer, such networks and collaboration
852   can resulted in quarantinable consumption and according to Witjes and Lozano [57] it reduces the
853   use of raw material and waste generation also. Finding exposes that the Bottom of pyramid has
854   centered in the hotspot of designing sustainable business models in in develop countries. It is found
855   that sustainable business models offer solutions such as designing a market-oriented business model
856   to provide win-win solutions for multiple stakeholders. The research in the common field of business
857   model sustainability and hotels, as the most important sectors of hospitality industry, are still in the
858   infancy stage as most of the studies have tried to investigate the sustainability level of the hotels
859   rather than providing solutions for development of a sustainable business model.

860   Illustrating the research path and articulating in detail the application of sustainable business
861   models in different industries, sectors, and research area are the contributions of this study that

862 provide insights and the possibility of compressions for both practitioners and researchers who are
863 eager to find sustainable solutions through sustainable business models. Different approach has
864 revealed and to design a sustainable business model and the most come one was designing a
865 sustainable value proposition which is able to provide values to multi-stakeholders such as society
866 and environment while it can be profitable for the organization. Sustainable value creation and value
867 delivering plus B2B partnerships are other solutions have emerged in the literature for developing a
868 sustainable business model.

869 **5. Conclusions**

870   The process of sustainable business model construction forms an innovative part of business
871 strategy. Different industries and business types have utilized sustainability business models to
872 satisfy their economic, environmental and social goals simultaneously. This study is conducted to
873 present the state of the art of sustainable business models in various application areas. The business
874 models are classified and reviewed in different application groups. To do so, a review is conducted,
875 and the findings reveal that the application of sustainability business models can be classified in 16
876 unique categories. The key contribution of this study is providing an insight about the state of the art
877 of sustainable business models in various application areas and its research path. It is found that
878 sustainable business models offer solutions such as designing a market-oriented business model to
879 provide win-win solutions for multiple stakeholders. The research in the common field of business
880 model sustainability and hotels, as the most important sectors of hospitality industry, are still in the
881 infancy stage as most of the studies have tried to investigate the sustainability level of the hotels
882 rather than providing solutions for development of a sustainable business model.

883   Illustrating the research path and articulating in detail the application of sustainable business
884 models in different industries, sectors, and research area are the contributions of this study that
885 provide insights and the possibility of compressions for both practitioners and researchers who are
886 eager to find sustainable solutions through sustainable business models. Different approach has
887 revealed and to design a sustainable business model and the most come one was designing a
888 sustainable value proposition which is able to provide values to multi-stakeholders such as society
889 and environment while it can be profitable for the organization. Sustainable value creation and value
890 delivering plus B2B partnerships are other solutions have emerged in the literature for developing a
891 sustainable business model.

892 **Conflicts of Interest:** Authors have no conflicts of interests

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