1 *Review*

2 Sustainable business model: a review

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12 **Abstract:** A sustainable business model describes the rationale of how an organization creates,
13 delivers, and captures value, in economic, social, cultural or other contexts in a sustainable way. The
14 process of sustainable business model construction forms an innovative part of business strategy.
15 Different industries and business types have utilized sustainability business models to satisfy their
16 economic, environmental and social goals simultaneously. This study is conducted to present the
17 state of the art of sustainable business models in various application areas. The business models are
18 classified and reviewed in different application groups. To do so, a review is conducted, and the
19 findings reveal that the application of sustainability business models can be classified in 16 unique
20 categories. The key contribution of this study is providing an insight about the state of the art of
21 sustainable business models in various application areas and its research path.

22 **Keywords:** sustainable development; sustainability; business model; sustainable business model;
23 modeling; review; survey; classification; taxonomy

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27   **Table of Contents**

46

47   **1. Introduction**

48   Bocken and Short [1] believe that to increase the efficiency of use of resources show significantly

49   increase to reduce the loss of environmental and social value. Creating value for triple bottom line,

50   i.e. economic, society and environment is an approach that businesses take to implement sustainable

51   development [2]. The importance sustainability issues are globally as the economic activities of the

52   businesses have societal and environmental effects influencing the human being and the nature

53   in general.

54   Internationalization has increased worldwide competition among the firms and the

55   businesses are always struggling with finding the solutions to win the competition. advanced

56   technological developments have made the competitions much tougher as productivity and

57   profitability has turn into necessities. Focusing on profitability is resulted in neglecting the

58   possible impacts that such economic activities have on the environment and the society. New

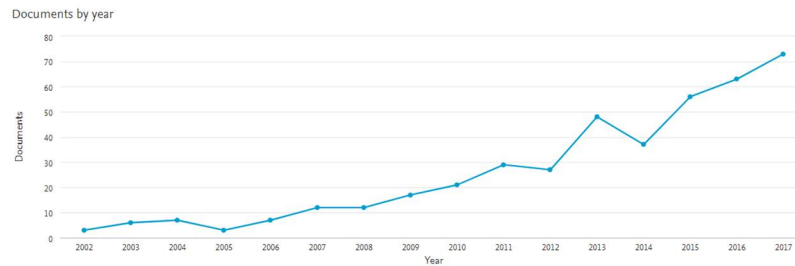
59   trends, rules and strategies on reducing the harm effect of business activities on the environment

60   and society have imposed the firms to seek solutions facilitating them in meeting their economic

61   benefit and sustainability goals simultaneously. As it is depicted in figure 1, number of

62   publications in SBM is remarkably increased from 1999-2018. It implies that one of the serious

63   solutions for sustainable development is SBM and the firms have utilized SBMs to have eco-socio

64   friendly business activities.

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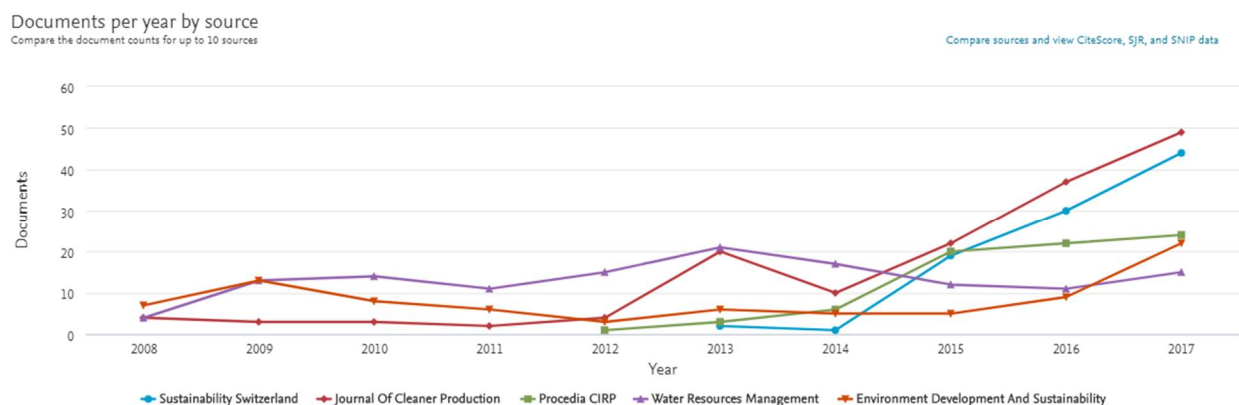
66   **Figure 1**. Number of publications in sustainable business model from 1999-2018.

67   The solutions provided in the literature different for implementation of SBMs vary by the
68   industries. The nature of the industry is very determinant in the approaches that the firms can
69   select for their SBMs. On the other hand, that implementation of an SBM implies change,
70   innovation or adjustment with new activities. Since sustainability deal with triple bottom line
71   factors, addition to the financial benefit [3-5] the benefits of multiple-stakeholders such as
72   customers, suppliers, shareholders etc. have been considered in the sustainable development.
73   Therefore, transition toward SBMs requires to look beyond the entity of the firm and it needs
74   innovation activities to create value for triple bottom line. Hence, Incremental changes are insufficient
75   to encounter with sustainable development challenges [6-7]. The current study provides insights
76   about the research path of sustainable business model (SBM). The paper, as a literature review,
77   increase the knowledge of how different industries, sectors, research areas apply SBMs in order
78   to achieving sustainability goals and reaching sustainable development.
79   A primary search in the literature disclosed that the number of publications in SBMs, as it is
80   shown in figure 1, is outstandingly increasing year to year. it is diagnosed that Sustainability, Journal
81   of Cleaner Production, Procedia CIRP, Water Resources Management, Environment Development
82   and Sustainability are the major journals have published of the results and findings of research on
83   SBMs. Figure 2 also clarifies that the number of documents is published in these journals are sharply
84   increasing particularly from 2015 onward. Journals of Cleaner Production and Sustainability have
85   had the most share of these trend as they have published the most publications in SBMs.

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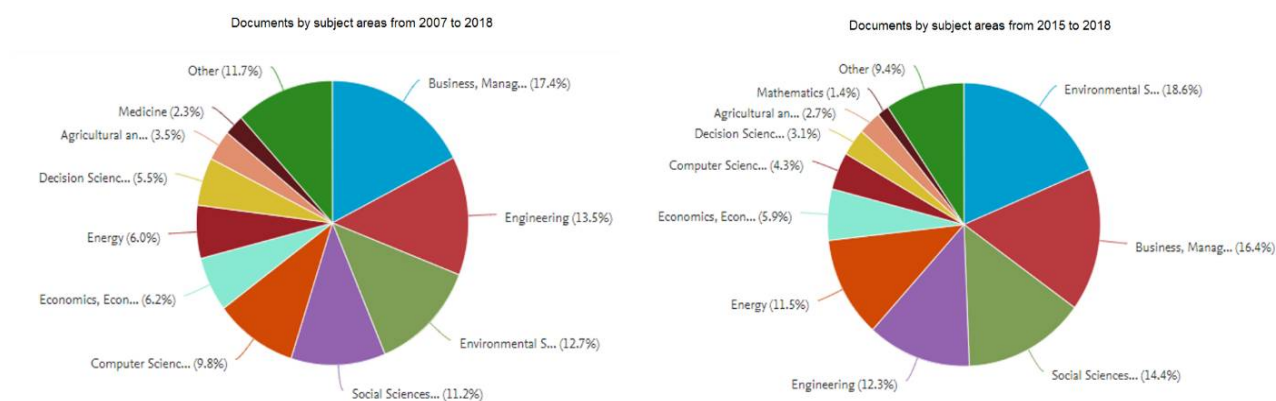
87   **Figure 2.** Number of publications in sustainability business model in different journals.

88   In figure 3, the data related the different subject areas have utilized SBMs in their either title, or
89   abstract, or keywords. The pie chart in the left-side refers to the documents are published between

90   2007 to 2018 and the right-side pie chart refers to the documents published from 2015 onward.
91   According to figure 3, 'Business, Management and Accounting (with 17.4%)', 'Engineering (with
92   13.5%)', 'Environmental Science (with 12.7%)', and 'Social Science (with 11.2%)' are respectively the
93   subject areas have borrowed the concept of SBMs and they all together have published more than
94   half (i.e. 54.8%) of the documents. While during last three years, from 2016 so far, the focus of these
95   order of subject areas are changed and 'Environmental Science (with 18.6%)', 'Business, Management,
96   and Accounting (with 16.4%)', 'Social Science (with 14.4%)', and 'Engineering (with 12.3%)' are
97   subject areas have respectively published the most documents related to SBMs which is the
98   representation of a considerable shift of literature of SBMs on environmental science.

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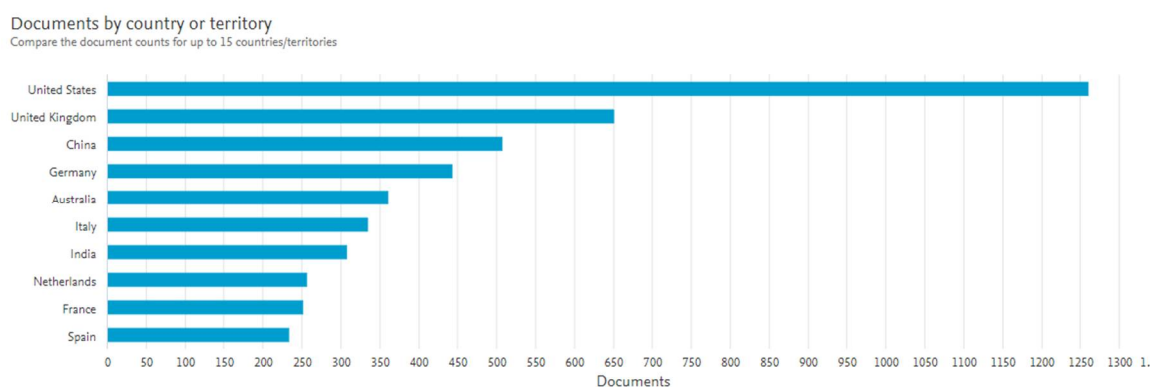
100   **Figure 3.** Application of sustainable busienss model in different subject areas.

101   A precise look at the research on the SMBs reveals that the research on SBMs is more prevalent
102   in the U.S than other countries. Figure 4 indicates that more than 2500 research related to SBMs are
103   dome in the context of the U.S, from 2007 to 2018. The U.K, China, Germany, and Australia are
104   respectively countries in which the research is conducted on SBMs.

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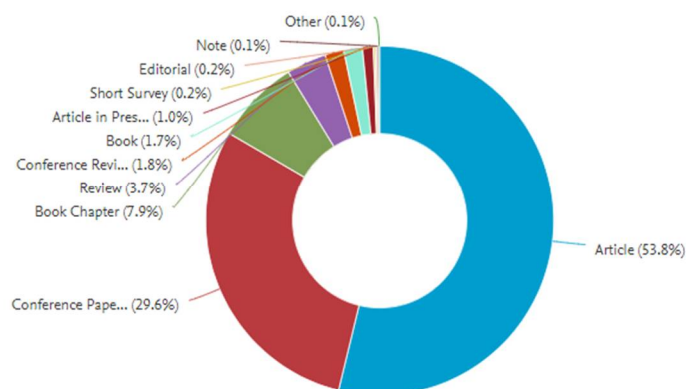
106   **Figure 4.** Research on SBMs in different countries from 2007 to 2018.

107   Among the documents published in the area of SBM 53.8% of them are original research articles,
108   29.6% of conference papers, 7.9% book chapter, and 3.7% of them are review articles. As figure 5
109   represents, original research article is the most common document is published in the area of SBM
110   between 2007 to 2018.

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112   **Figure 5.** Types of documents are published in the area of SBM from 2007 to 2018.

113   A primary search in the literature of SBMs, it is found that 3688 documents in 27 different subject
114   areas are published. Table 1 constitutes the detail related to these 27 subject areas and the number of
115   articles has published in their area utilizing SBM in their title, or abstract or keywords.

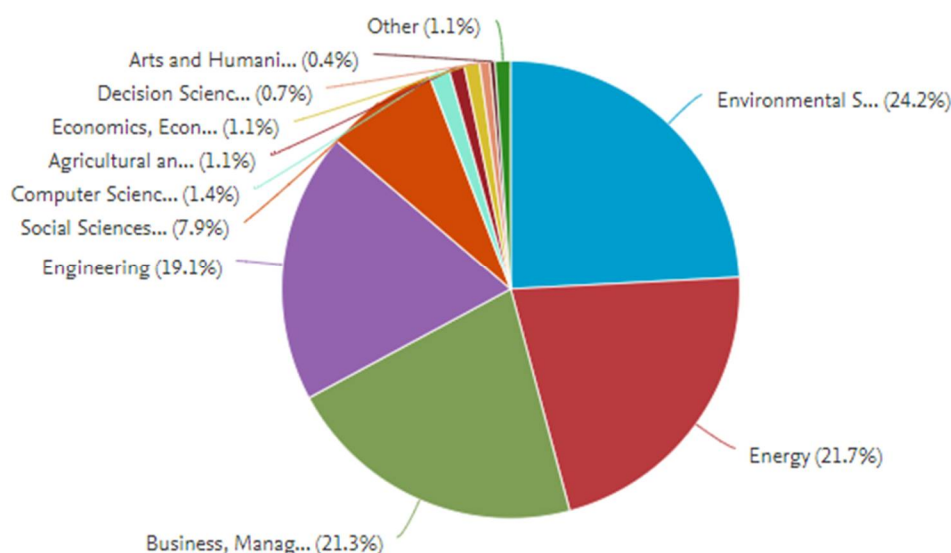
116   **Table 1.** Application of sustainable business models in different subject areas, based on the primary
117   search, from 2016 to 2018.

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

118   In the section of materials and methods, the data collection and reviewing process has
119   elaborately explained. In the review section, a pic picture of the current research on SBMs, firstly,
120   is provided and then the application of SBMs in different areas are discussed. In the discussion
121   and conclusion section, the findings are articulated and application in detail and
122   recommendations were presented for organizations and future research.

123   **2. Materials and Methods**

124   (TITLE-ABS-KEY ("sustainable business model") AND ALL (sustainability) AND ALL (
125   "Sustainable development")) AND DOCTYPE (ar) AND PUBYEAR > 2015
126   When we narrow our search to the "Sustainable development" and "sustainability", the number
127   of articles drop to 86, and the subject areas change as follow:

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129   **Figure 6.** The subject areas of the articles are considered for future analysis in this study.

130   Where Environmental Science, Energy, Business, Management and Accounting, Engineering,
131   and Social Sciences will make our major classes of taxonomy.

132   **3. Review**

133   Sustainable business models leverage the firms to integrate their economic objectives with their
134   sustainability ambitions in such a way the benefits of all the stakeholders achieve simultaneously [8].
135   Porter and Kramer [9] argue that sustainable business models are sources of competitive advantage
136   in which incorporating sustainable value proposition, value creation and value capturing
137   mechanisms bear economic benefits to the companies. Boons and Lüdeke-Freund [10] count four
138   main characteristics of a sustainable business model distinguishing it from a conventional business
139   model. They believe that the value proposition of SBMs is an ecological or social value in accordance
140   with economic value. In the supply chain of SBMs suppliers feel responsibility towards the focal

141 company's stakeholders as well. The SBMs encourage the sustainable consumption. Ultimately,
142 Boons and Lüdeke-Freund [10] express that in design of the financial model of the SBMs, addition to
143 the economic benefits, the company's ecological and social impacts are also considered. Abdelkafi &
144 Täuscher [11] define sustainable business models as tools incorporating sustainability in the firms'
145 value proposition and value creation logic. Per se, SBMs not only provide value to their customer,
146 but also to the natural environment and society. Geissdoerfer, Bocken, and Hultink [12] consider
147 SBMs as a set of the elements in which the interrelation between these elements and their interactions
148 with the stakeholders create, deliver, capture, and exchange sustainable value for its multi-
149 stakeholders.

150   Businesses with different characteristics from different industries are aided by SBMs to achieve
151 their sustainability ambitious. Besides, many researchers have incorporated this concept with the
152 other concepts to provide possible solutions for the businesses for sustainable development. This
153 section articulates in detail that how SBMs are applied in areas of innovation, management and
154 marketing, entrepreneurship, energy, fashion industry, healthcare industry, agri-food, supply chain
155 management, circular economy, developing countries, construction and engineering, hospitality
156 industry.

157 *3.1. Innovation*

158   Much research has conducted on the common fields on innovation and sustainable business
159 model which mainly strive to propose models, frameworks, or guidelines to elaborate how to
160 innovate a sustainable business model or how to shift a traditional business model to a sustainable
161 business model. Evans *et al.* [13] provide five paradigms for such transformation toward a sustainable
162 business model.

163   Evans *et al.* [13] articulate that the firs approach to design a sustainable business model is to
164 design sustainable value that incorporates economic, social and environmental benefits
165 conceptualized as value forms. According to Evans *et al.* [13], the second way to design an SBM is to
166 create a system of sustainable value flows among multiple stakeholders, including the natural
167 environment and society as primary stakeholders. Generating a value network with a new purpose,
168 design and governance is the third path toward an SBM. The fourth paradigm to have an SBM is to
169 consider systemically the stakeholder interests and responsibilities for mutual value creation. Finally,
170 internalizing externalities through Product Service System also enables innovation towards SBMs.

171   Geissdoerfer, Bocken and Hultink [14], inspired by design thinking, developed the concept of
172 'Value Ideation' comprising value ideation, value opportunity selection, and value proposition
173 prototyping. Based on the first principle of Evans *et al.* [13] model, the approach of Geissdoerfer *et al.*
174 [14] to design e a sustainable business model is to design a sustainable value proposition in which
175 additional forms of value are created through identifying formerly underserved stakeholders
176 (including society and environment) in the value proposition.

177   Likewise, "Value Triangle" is a new framework to design a sustainable business model that is
178 proposed by Biloslavo, Bagnoli and Edgar [15]. The VT is a tool allows a firm to capture economic
179 value from a circular value system in which the value is co-created and co-delivered through the
180 collaboration of the firm with its stakeholders. In other words, the value generated in value triangle
181 is able to meet the benefits of customers (customer value), partners and suppliers (partner value),

182 social actors including environment and future generation (i.e. public value), and the firm itself
183 (captured value).

184   Oskam, Bossink, and de Man [16] propose the concept 'value shaping' for sustainability-oriented
185 innovations that is able to clarify all the types of financial, social and environmental value that a
186 business create by interacting with the different networks. They outline that depends on the place of
187 the business model in the life cycle curve, different networks assist the business to design the value.
188 Exploring value refers to the value the firm explores through the existing network and the social
189 network of entrepreneurs. Developing value point out the firms shape their value proposition
190 through engagement of the potential customers. Reframing value refers is the stage in which the
191 feedbacks from the real customers are utilized to refine the delivered value. Finally, Oskam *et al.* [16]
192 argue that redirecting value refers to shifting from the current value to other value/values due to
193 change in mind-set of the firms; or redirecting value from the direct customers towards the end clients
194 of the products.

195   Joyce and Paquin [17] provide a novel approach to design a sustainable business model. They
196 propose a Triple Layered Business Model Canvas to meet the economic, social, and environmental
197 benefits in which these three layers respectively explain how the value creation and delivering
198 process satisfy the benefits of the business, society and the environment.

199   Roman, Liu, and Nyberg [18] propose a three-step approach to design a sustainable business
200 model for transforming toward open access databases in which research data created from university
201 are accessible to industry for facilitating the open innovation process. Their model comprises three
202 stages of identifying the possible opportunities, recognizing the barriers, and finally designing the
203 model.

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

Author/s	Year	Contribution	Methodology	Data Source
Evans et al [13]	2017	Framework	Qualitative	Literature synthesis
Geissdoerfer, Bocken and Hultink [14]	2016	Framework	Qualitative	Literature synthesis, expert interviews, and multiple workshops
Biloslavo, Bagnoli and Edgar [15]	2018	Framework	Qualitative	Systematic literature review, case study
Oskam, Bossink, and de Man [16]	2018	Framework	Qualitative	Case study, interview, secondary data
Joyce and Paquin [17]	2016	Framework	Qualitative	Literature synthesis, secondary data
Roman, Liu, and Nyberg [18]	2016	Framework	Qualitative	Case study, interview

205 *3.2. Management and Marketing*

206   Business models have been considered as tools to implement the business strategies. Therefore,
207 it makes sense that the goals of the business models should be aligned with the organizations' goals.
208 Research has proved that designing a business model which can provide sustainability to the society,
209 environment and the business itself requires a prerequisite: providing sustainable values to the
210 society and the environment should be considered in the purpose of the organization, at first.

211   Stubbs [19] by studying the characteristics the sustainable business models of B Corporations
212 illustrates that social and environmental concerns are embedded in the mission and purpose of B
213 Corporations and the main goal of such corporations is to create positive societal impacts for its
214 stakeholders. He realized that such thinking affected the value propositions, value creation and value

215 delivering of B corporations and the B Corps align their profit and societal impact. It is worth
216 mentioning that businesses can be certified as B Corps that they have had the highest performance in
217 social and environmental standards, public transparency, and legal accountability.

218   Morioka, Bolis, Evans, and Carvalho [20] conducted a multiple case studies in eleven
219 organizations from diverse sectors, situated in Brazil and in the United Kingdom. They realized that
220 to integrate sustainability into SBM's value creation and delivery system, the organizations should
221 firstly, make a connection between business purpose and employees' values and believes, then they
222 should be pro-active and clear engagement in solving sustainability problems.

223   In addition to aligning the goal of business model with the business's itself, the rule of decision
224 makers in implementing a business model should not be neglected. Kurucz, Colbert, Lüdeke-Freund,
225 Upward, and Willard [21] explain that how relational leadership advance the design and assessment
226 of sustainable business models. According to Kurucz *et al.* [21] relational leadership processes that
227 support strongly sustainable organization management help organizations to address effectively the
228 existing constraints and also to avoid contributing to the tightening of future limits of the biosphere.
229 They articulate that by engaging relational leadership in strongly sustainable business model canvas
230 (ssbmc) and the future-fit business benchmark (f2b2) organizations can define and strive for their
231 sustainability goals. Upward and jones (2016) argue that the strongly sustainable business model
232 canvas demonstrates relational leadership characteristics that support business modelling toward
233 strategic sustainability. Additionally, Kurucz *et al.* [21] explain that the future-fit business benchmark
234 (f2b2) provides a 'fourth benchmark' which defines the ultimate goal of zero negative impact on the
235 socio-ecological system

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

243   By studying firms that provide energy efficiency products and services Tolkamp, Huijben,
244 Mourik, Verbong, and Bouwknegt [22] found that utilizing a user-centered approach to design a
245 sustainable business model is the key to success of these firms. He realized that firms engage the
246 customers in designing their business model in form of a four-stage loop including: design of
247 involvement, facilitation of involvement, extraction of lessons learned and finally business model
248 adaptation. In other words, Tolkamp *et al.* [22] claim that identifying and incorporating the customer
249 needs into the firm's value proposition is of utmost importance in designing an effective and
250 sustainable business models.

251   Baldassarre, Calabretta, Bocken, and Jaskiewicz [23], aided by principles user-driven innovation,
252 provide practical framework to design a sustainable business model through designing a sustainable
253 value proposition. User-driven innovation present solutions meeting the benefits of society and the
254 business, at the same time through an iterative process in which potential customers are engaged in
255 the design of value proposition.

256   De Bernardi and Tirabeni [24] perceive that designing a sustainable business model involves
257 designing a community-centered sustainable value proposition. They by combining principles from

258 both SBM innovation and user-driven anti-consumption and well-being habits they intended to
259 design a sustainable business model that enhance sustainable and anti-consumption behaviours.
260 They studied the Italian Food Assembly, which is a successful example in Alternative Food Network
261 (AFN). De Bernardi and Tirabeni [24] found out two main factors have caused Italian Food Assembly
262 implemented a sustainable business model: 1) there is a strong knowledge sharing of sustainable
263 consumption behaviours among the members and 2) there is an effective distribution of best practices
264 among them also.

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

Author/s	Year	Contribution	Methodology	Data Source
Stubbs [19]	2017	Design & Process	Qualitative	Interview
Morioka et al [20]	2018	Framework	Qualitative	Case Study
Kurucz et al. [21]	2017	Conceptual model	Qualitative	Literature synthesis
Tolkamp et al. [22]	2018	Design & Process	Qualitative	Interview
Baldassarre et al. [23]	2017	Framework	Qualitative	Literature synthesis, expert interviews, and multiple workshops
De Bernardi and Tirabeni [24]	2018	Design & Process	Qualitative	Case Study, depth interviews, participant observation, focus groups and document analysis.

266 *3.3. Entrepreneurship*

267   Davies and Chambers [25] argue that the sustainable entrepreneurs encounter with hybrid
268 tensions when they focus on creating economic value whilst increasing social or environmental value.
269 They argue that conflicts among different value capturing process leads in a business instability, and
270 a business model innovation is the solution to eradicate the conflict. Gasbarro, Rizzi, and Frey [26]
271 provides empirical insights how sustainable entrepreneurs cope with regulative, normative and
272 cultural-cognitive issues to increase institutions' legitimacy by developing a sustainable business
273 model.   They articulate that institutional entrepreneurs (SIEs) designing innovative business models
274 by engaging the final customers and strategic partnerships in developing innovative value
275 propositions process to, firstly, increase the benefit of innovative sustainable business models,
276 secondly, to imitate the possible conflicts, and ultimately to change industry norms and social beliefs
277 and cultural-cognitive barriers in a value proposition so as for increase legitimacy within the
278 normative and cultural-cognitive institutions.

279   Khalid, Hassam, and Ahmad [27] consider the entrepreneurial action theory as an alternative to
280 entrepreneurship theory since it has an important role in the sustainable business innovation model.
281 Significant knowledge derived from entrepreneurial action provides a better understanding about
282 how to develop and establish sustainability-innovation ventures. Whilst, Neumeyer and Santos [28]
283 reveal that although the networks of sustainable entrepreneurial ventures are more densely
284 connected in compare to conventional entrepreneurs, sustainable entrepreneurs are
285 underrepresented, in the Southeast United States. [29] also provides empirical evidences that the
286 investors reluctant to invest on the sustainable start-ups, particularly those are environmentally
287 sustainable. On the other hand, de Lange [29] also illustrate that the investors are attracted to invest
288 on the start-ups in the sustainable national context.

289

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

Author/s	Year	Contribution	Methodology	Data Source
Davies and Chambers [25]	2018	Theoretical and empirical evidence	Quantitative	Multiple case study, interview
Gasbarro et al. [26]	2018	Empirical evidence	Qualitative	Interviews and archive data
Khalid et al. [27]	2016	Framework	Qualitative	Literature synthesis
Neumeyer and Santos [28]	2018	Empirical evidence	Quantitative	Literature synthesis, interview, secondary data
de Lange [29]	2017	Empirical evidence	Quantitative	Secondary data

291   *3.4. Energy*

292   One of the objectives of sustainable business model is to eliminate (or at least minimize) the
293   harmful effect of the businesses on the environment. Many approaches are provided in the literature
294   for the businesses to reach this sustainable goal. Management of the resource and energy is of utmost
295   importance in meeting the sustainability goals. Moschetti, Brattebø, Skeie, and Lien [30] propose an
296   analytic process based on the execution of quantitative sustainability analyses, to transition from a
297   traditional focus of business models on economic value and customers toward proposing, creating,
298   and capturing sustainable values for the environment and the society. Sousa-Zomer and Cauchick
299   Miguel [31] investigate how such sustainable business model can support technological innovations
300   such as decentralized approaches for water quality and quantity improvements in urban areas. Their
301   founding revealed that having a sustainable business model through a close integration with
302   customers improve consumers' acceptance, risk perception, and confidence in decentralized
303   approaches.
304   Zhang, Guo, Gu, and Gu [32] propose a framework which assists the decision makers to develop
305   sustainable business models for high energy-consuming equipment (HECE). Aided by Product
306   Service System (PSS), they suggest a decision-making support tool for developing PSS of HECE. In
307   their opinion, in a sustainable business model the benefits of all the stakeholders are considered. The
308   illustrated that extra economic benefits impose more burdens and higher risk to the environment.
309   And developing PSS is not always sustainable as in gas supply service, for instance, it would lead to
310   extra economic and environmental burdens due to frequent transportation.
311   Rossignoli and Lionzo [33] provides empirical evidence of new forms of interdependencies
312   arising within partnership networks drive businesses in the energy sector to have a sustainable
313   business model. He believes that a network induces its contributors to expand their definition of
314   value and requires them to create value for both companies and society as the main objective of their
315   business model. According to Rossignoli and Lionzo [33], the new links among participants of a
316   network create new approaches for capturing value and assist them to solve the concerns related to
317   the resource dependency, which is achieving sustainability goals.
318   Nichifor [34] conducted a research to compare the current sustainable business models of the
319   current firms in the wind and solar energy sector in Romania. She founds that Both sectors have
320   encountered egregious changes in last two years due to the changes in supporting plans that affect
321   renewable energy markets and have developed them. In addition, Nichifer [34] found out these
322   supportive plans have attracted investors are a pessimistic outlook of future investments due to legal
323   instability that made them to reduce the wind projects.

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

Author/s	Year	Contribution	Methodology	Data Source
Moschetti et al. [30]	2018	Model	Quantitative	Literature synthesis and case study
Sousa-Zomer and Cauchick Miguel [31]	2018	Design & process	Qualitative	Case study
Zhang et al. [32]	2018	Framework	Qualitative	Literature synthesis and case study
Rossignoli and Lionzo [33]	2018	Empirical evidence	Qualitative	Case study, interview, questionnaire
Nichifer [34]	2015	Empirical evidence	Qualitative	Case study, interview, questionnaire

325   *3.5. Fashion*

326   Pal and Gander [35] also believe that the traditional business models in the fashion industry
327   produce highly negative outcomes for the environment through high water usage, chemical
328   pollutions, and incineration or landfill of a large amounts of unsold stock. Ciasullo, Cardinali, and
329   Cosimato [36] also claim that the fashion industry is unsustainable as active companies in this
330   industry imposed many economic, social and environmental burdens. Therefore, many tools and
331   approach have emerged to design a sustainable business model for coping with these social and
332   environmental issues in the fashion industry. Kozlowski, Searcy, and Bardecki [37], for instance,
333   develop a new design tool, called the reDesign canvas, to assist sustainable designers in the fashion
334   industry. They propose a business model canvas with 12 building blocks ensuring the entrepreneurs
335   to build a sustainable fashion brand. Hirscher, Niinimäki, and Joyner Armstrong [38] aiding by social
336   manufacturing theory strived to design a more sustainable innovative value in design and
337   manufacturing of fashion. They use do-it-yourself (DIY), do-it-together (DIT) design strategies in
338   which users turned into the value creators to develop a sustainable business model.

339   Slow fashion is an approach aimed at intensifying sustainability in the fashion industry. Jung
340   and Jin [39] conducted a research to investigate the profitability this approach in the fashion industry.
341   Customer value creation framework, which is one of the slow fashion solutions, refers to creating
342   perceived customer value. The provide empirical evidence that participating the customers in the
343   value creation process increases their intention to pay a price premium for slow fashion products.
344   Jung and Jin [39] found out delivering creating customer value for slow fashion positively affects
345   consumers' purchase intentions which can secure an economically sustainable business model, while
346   it continuously ameliorating environmental and social sustainability.

347   Pal and Gander [35] argue that incongruence of fashion customers' value with the value
348   propositions and the barriers in transition of supply chain toward a slowing and a closing loop of
349   resources are detrimental to developing a sustainable business model in the fashion industry. [35]
350   believe that development of a business model should be considered as a system for creating value for
351   the customer and environmental and capturing value for the firm so that the firms can replace the
352   dominant, unsustainable model with sustainable business models in fashion industry.

353

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

Author/s	Year	Contribution	Methodology	Data Source
Pal and Gander [35]	2018	Theoretical Evidence	Qualitative	Literature synthesis
Kozlowski *et al.* [37]	2018	Framework	Qualitative	Literature synthesis, participatory action research (PAR), and interviews
Hirscher *et al.* [38]	2018	Framework	Qualitative	Literature synthesis, workshop, and interview
Jung and Jin [39]	2016	Empirical evidence	Quantitative	Questionnaire

355   *3.6. Healthcare Industry*

356   Nikou and Bouwman [40] conduct a systematic literature review based on a business model
357   ontology to find the applications of mobile technology and devices in the healthcare industry. Their
358   findings illustrate that in order for Mobile Technology contribute to the design of sustainable business
359   models in the healthcare industry, non-technological business model components such as value
360   proposition, organizing and revenue models should be considered rather than focusing on the service
361   platforms. In other words, to design a sustainable business model in the healthcare industry by
362   utilizing Mobile Technology, value propositions should be designed based on the customers values
363   to provide social benefits and the value capture processes should be designed to provide economic
364   benefits. Merchant, Ward, and Mueller [41] claim that utilizing Telemedicine (also known as
365   telehealth) is a tool that provide sustainability to the hospitals. According to Merchant, Ward, and
366   Mueller [41], Telemedicine provides solutions to design value propositions to develop a sustainable
367   business model. Their results disclose that, although, hub hospitals are more responsible for the
368   design of sustainable business models in compare to the spoke hospitals in the U.S., both hub and
369   spoke hospitals pointed out that telemedicine helps them to meet their mission, facilitates access,
370   keeps lower-acuity patients closer to home, and helps head off competition. However, Anwar and
371   Prasad [42] argue that although telemedicine has presented many solutions for developing a
372   sustainable business models in the healthcare industry, adoption to such technology has turned into
373   the utmost importance. Because evolution and sometimes revolution in this technology has made it
374   hard to the users to get used to it. Anwar and Prasad [42] recommend a continuous eHealth literacy
375   so as for, firstly, facilitating the transition era and secondly, the development of new business models
376   in which the users' involvement and motivation and also the revenue generation have been
377   considered. They express that the telemedicine services should be user- friendly and sustainable
378   which are able to integrate all stakeholders' benefits in one system.

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

Author/s	Year	Contribution	Methodology	Data Source
Nikou and Bouwman [40]	2017	Theoretical evidence	Qualitative	Literature synthesis
Merchant, Ward, and Mueller [41]	2015	Theoretical & empirical evidence	Qualitative	Literature synthesis, secondary data, and interviews
Anwar and Prasad [42]	2018	Framework	Quantitative	Literature synthesis

380   *3.7. Agri-food*

381   Research interest in providing sustainable solutions for developing business models in the agri-
382   food sector has increased in these years [43]. Franceschelli, Santoro, and Candelo [44] argue that

383   development of sustainable business model innovation within the food industry, especially for start-
384   ups, is of utmost importance, because the industry is itself linked with nature and human respect.
385   Barth, Ulvenblad, and Ulvenblad [43] by conducting a systematic literature review, proposes a
386   conceptual framework for sustainable business model innovation in the agri-food sector which can
387   meet the challenges encountered in taking a sustainability perspective.

388   Franceschelli *et al.* [44] contribute to the extant research by introducing the concept of sustainable
389   innovation within the business model literature. They utilize business model canvas to design an
390   innovative sustainable business model for food start-ups. Franceschelli *et al.* [44] propose a
391   sustainable business model based on business model canvas by providing sustainable solutions for
392   each component of the business model.

393   Lee and Slocum [45] study the meeting organizers who plans the meetings food and beverage
394   providers. They provide empirical evidences that such meeting organizers have selected to have a
395   sustainable business model by organizing the meetings for the local foods. Although they have a
396   contractual flexibility to select foods, there is a willingness to pay a price-premium for local products.
397   Lee and Slocum [45] also show that the meeting/event attendees have not considered themselves
398   sustainable yet and there is a need to increase the knowledge of and the benefit of local foods (which
399   are organic and harmless for the environment) to enhance the attendees' knowledge about
400   sustainability.

401   Robinson, Cloutier, and Eakin [46] prove that the landscaping enterprises have a sustainable
402   business model, thereby provide multifunctional edible landscapes in the cities, have a greater range
403   of value propositions and revenue streams resulting in increasing their competitive advantage. They
404   express that these enterprises can have the potential value creation of edible landscaping ranged
405   between $3.9 and $66 billion, and that positive return on investment (ROI) could be achieved within
406   one to five years.

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

Author/s	Year	Contribution	Methodology	Data Source
Barth et al. [43]	2017	Framework	Qualitative	Systematic literature review
Franceschelli et al. [44]	2018	Theorical Evidences	Qualitative	Case study, secondary data, and interviews
Lee and Slocum [45]	2015	Empirical Evidences	Quantitative	Questionnaire
Robinson et al. [46]	2017	Empirical Evidences	Qualitative	Interview, and GIS landscape analysis

408   *3.8. Supply Chain Management*

409   Supply chain management is another sector has borrowed the concept of sustainability business
410   model as a possible solution to meet sustainable development. The objective of sustainability is to
411   address environmental and socio-economic issues in the long term [47]. Ray and Mondal [48] provide
412   evidences illustrate that collaboration is better than competition to sustain in the market. They argue
413   that collaboration among firms within a closed-loop supply chain (CLSC) leads in sustainable
414   business model in which the benefits of three bottom line concepts, i.e. protect environment, improve
415   economic performance, and social performance, can be met. Therefore, Ray and Mondal [48] propose
416   a collaborative business model and mechanism for collaborative business strategies in a CLSC. Witjes
417   and Lozano [47] also proved evidences classifying that collaboration is crucial to develop sustainable

418 business models for supply chain management. They believe that collaboration between procurers
419 and suppliers in the procurement process mitigate the use of raw material and waste generation
420 through the development of sustainable business models. Witjes and Lozano [47] declare in a
421 collaboration business model, suppliers and procurers gain experiences in the collaboration process
422 to improving circular economy objectives contribution and to secure economic benefits for both
423 parties, at the same time.

424   Geissdoerfer, Morioka, de Carvalho, and Evans [49] inspired by circular business model concept
425 and circular supply chain management concepts strive to design a sustainable framework to provide
426 solutions for sustainable supply chain management. They disclose that circular business model
427 provides different solution for different loops: closing loops, slowing loops, intensifying loops,
428 narrowing loops, and dematerializing loops.

429   Brennan and Tennant [50] conducted a comparative case study to find out how to resolve trade-
430 offs in sustainable supply chain management. They realized that for transition from a traditional
431 supply network toward sustainable supply network, business model innovation requires to create
432 sustainable values and resolve trade-offs. They illustrate how network-centric business model
433 innovation provides sustainable solutions for the trade-off between economic and environmental
434 benefit through the prioritization of sustainability-related 'cultural' resources.

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

Author/s	Year	Contribution	Methodology	Data Source
Ray and Mondal [48]	2017	Framework	Qualitative	Systematic literature review
Witjes and Lozano [47]	2016	Theorical Evidences	Qualitative	Literature synthesis
Geissdoerfer *et al.* [49]	2018	Framework	Qualitative	Literature synthesis, case study, interviews
Brennan and Tennant [50]	2018	Empirical Evidences	Qualitative	Case study and Interview

436 *3.9. Circular Economy*

437   Circular economy in the literature, has widely considered as a tool to implement and design a
438 sustainable business model in the different sectors in response to current unsustainable trajectories.
439 As it is shown in the table 9, Witjes and Lozano [47] and Geissdoerfer *et al.* [49] utilized this concept
440 to design a sustainable business model for the area of supply chain management. In this section, will
441 the other articles that have benefited from the Circular Economy for designing a sustainable business
442 model are compiled and submitted.

443   Heyes, Sharmina, Mendoza, Gallego-Schmid, and Azapagic [51] applied the Backcasting and
444 Eco-design for the Circular Economy (BECE) framework to identify how ICT firms diagnose circular
445 business model innovations. BECE is designed for the product-oriented firms that is why Heyes *et al.*
446 [51], by shifting the focus to a user-centered eco-design, design a circular economy models consistent
447 with the company's priorities of customer satisfaction and profitability.

448   Todeschini, Cortimiglia, Callegaro-de-Menezes, and Ghezzi [52] by synthesizing of the current
449 literature have developed an innovative circular business model in which the value propositions are
450 sustainable and reduce environmental impacts. By conducting eight case studies on innovative
451 fashion startups, they identify the concept of 'born sustainable' which assist the entrepreneurs to
452 design sustainable value propositions to accomplish the circular economy objectives.

453   However, Stål and Corvellec [53] provide empirical evidence, based on seven case studies in
454   Sweden, that businesses pro-actively looking for increase institutional demands for circularity to
455   meet their own economic interests while that companies buffer their business model and their value
456   proposition from emerging demands.

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

Author/s	Year	Contribution	Methodology	Data Source
Heyes *et al.* [51]	2018	Framework	Qualitative	Literature synthesis, case study, workshop
Todeschini *et al.* [52]	2017	Framework	Qualitative	Literature synthesis, case study, interviews
Stål and Corvellec [53]	2018	Empirical Evidences	Qualitative	Literature synthesis, case study, interview

458   *3.10. Developing Countries*

459   Research conducted on sustainable business models in develop countries mainly address bottom
460   of the pyramid (BOP) context, where there are paucity of resources and population suffer from
461   poverty. Bottom of pyramid refers to the global poor who are in extreme poverty and are unable to
462   meet basic needs [54], most of whom live in the developing countries. According to the World Bank
463   reports, 2.7 billion, which are around half the global population, have less than $2 a day income [54].
464   In the literature, sustainable business models (SBMs) are consider as tools to create values for both
465   business and society. Designing a market-oriented business model has been widely recommended
466   for providing win-win solutions for multiple stakeholders.

467   Bittencourt Marconatto, Barin-Cruz, Pozzebon, and Poitras [55] provide evidences illustrating
468   the Brazilian government facilitates transition toward sustainable business model by providing
469   strategic and shared value opportunities. By study the Ecoelce project, they articulate how to design
470   an SBM in the BOP context of Northeastern Brazil. Dembek, York, and Singh [56] provide nine
471   individual business models addressing poverty through studying 55 organizations in Indonesia and
472   the Philippines. They create a BoP business model matrix to elaborate how the identified business
473   models create, offer, and capture value to benefit different stakeholders. Goyal, Sergi, and Kapoor
474   [57] provide strategic solution for the social enterprises to develop a sustainable business model
475   which can meet the underserved needs of the BoP segment in India. They propose a practical
476   framework for creating a sustainable, scalable and socially relevant ecosystem. Palomares-Aguirre,
477   Barnett, Layrisse, and Husted [58] study business models of three firms that provide affordable
478   housing for very poor people in Mexico. Their finding reveals that community engagement and
479   government collaboration are very important in creating and delivering a sustainable value so as to
480   better serve the BoP.

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

Author/s	Year	Contribution	Methodology	Data Source
Bittencourt Marconatto *et al.* [55]	2016	Empirical Evidences	Qualitative	Case stud, observations, interviews and secondary data
Dembek *et al.* [56]	2018	Framework	Qualitative	Primary and secondary data
Goyal *et al.* [57]	2017	Framework	Qualitative	Interviews and secondary data
Palomares-Aguirre *et al.* [58]	2018	Empirical Evidences	Qualitative	Literature synthesis, case study, interview

482

3.11. Construction and Engineering

Construction, the biggest industry in the developed world, has greatest environmental impact [59] as well as economic and social consequences [30]. However, Selberherr [60] claim that sustainable buildings bear many potential benefits for service providers and the society. Selberherr [60] proposes strategies for the players in the construction sector to proactively contribute to sustainable development of the society. She recommends that to design a sustainable business model which is aimed at cooperatively optimizing buildings and infrastructures and taking the responsibility for the operating phase via guarantees.

Wasiluk [61] provide empirical evidences that businesses in lieu of from justifying the business case for sustainability they should concentrate on understanding how to mobilize their intellectual capital to enhance an ecological sustainable and socially equitable enterprise. Indeed, she considers the intellectual capital as a mediator sophisticating sustainable value proposition for the Australian property and construction sector.

Boo, Dallamaggiore, Dunphy, and Morrissey [59] argue that there are approximately 190 million buildings in Europe which were built before energy efficiency was a common issue in construction. They consider innovative business models (IBM) as a solution to provide sustainability in the energy efficient building market. Boo, Dallamaggiore, Dunphy, and Morrissey [59] propose sustainable business models ensuring long- lasting change in the energy efficient building market. They believe that the co-evolution of business models with both the wider energy system and the natural environment is crucial for the development of a sustainable business model.

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

Author/s	Year	Contribution	Methodology	Data Source
Selberherr [60]	2015	Theoretical Evidences	Qualitative	Literature synthesis
Wasiluk [61]	2013	Empirical Evidences	Qualitative	Case study, interview
Boo *et al.* [59]	2016	Framework	Qualitative	Literature synthesis

3.12. Hospitality Industry

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

Buffa, Franch, and Rizio [62], utilizing a quantitative approach, provide empirical evidences that medium-sized hotel enterprises (SMHEs) in Trentino, a traditional tourist destination in the Italian Alpine Arc, apply sustainable business models. They argue that these SMHEs adopted three different sets of environmental management practices (EMPs) to accomplish their sustainability goals of their business models.

Høgevold, Svensson, Padin, and Dos Santos [63] compare the different between sustainable business models in manufacturing companies and hotels as a service sector. They believe that the nature of the industries is very effective in the models they have selected to meet the sustainability objectives. Tangibility and intangibility of the products and services influence the assessmentability of the social and environmental impact of their economic activities.

520   Results of the research of Melissen, Cavagnaro, Damen, and Düweke [64] disclose that the
521 current business models of hotel industry are not able to meet the sustainability objectives, especially
522 with respect to addressing guests' needs and wants and (subsequent) institutionalization of
523 sustainability. Nonetheless, they argue that managers' willingness and capabilities are potentially the
524 sources stimulating them to transit toward a sustainable business model.

525   Høgevold and Svensson [65] develop a sustainable business model for the hotels based on a case
526 study they have conducted among a major Scandinavian hotel chain known for having implemented
527 sustainable business practices within the company and in its business network. They are the only
528 study that have provided sustainable solutions for different element of business model in which the
529 benefits of multi-stakeholders have considered in value creating and capturing processes.

530   **Table 13.** Application of Sustainable business models in the hospitality industry.

Author/s	Years	Contribution	Methodology	Data Source
Buffa *et al.* [62]	2018	Empirical Evidences	Quantitative	Questionnaire
Høgevold *et al.* [63]	2016	Empirical Evidences	Qualitative	Case study, secondary data, company records, internet information, interviews and on-site observations.
Melissen *et al.* [64]	2016	Empirical Evidences	Qualitative	Literature synthesis, Interviews
Høgevold and Svensson [65]	2015	Empirical Evidences	Qualitative	Case study, secondary data, company records, internet information, interviews and on-site observations.

531 **4. Discussion**

532   This study provides a comprehensive review on the applications of SBMs in different industries,
533 sectors, and research area. Energy, fashion, healthcare, food, construction and hospitality are
534 industries have resorted to the principles of SBMs for realization of sustainable development.
535 Entrepreneurship, management and marketing, innovation, circular economy, and supply chain
536 management are research areas have utilized SBMs to provide solutions to achieve their
537 sustainability ambitious. Application of SBMs in the developing countries is another category has
538 emerged in the initial screening phase of the literature.

539   Finding reveals that circular business models, base of the pyramid, product service systems, are
540 the major strategies have considered in the literature to design sustainable business models that is
541 quite consistent with the findings of Bocken *et al.* [3]. Many authors consider designing a sustainable
542 value proposition as an approach to design a sustainable business model. In this regard, Geissdoerfer
543 *et al.* [14], Biloslavo *et al.* [15], Oskam *et al.* [16], Tolkamp *et al.* [22], Baldassarre *et al.* [23], De Bernardi
544 and Tirabeni [24], and Hirscher *et al.* [38] have presented innovative approaches in which customers
545 are engaged in the designing process to devise a sustainable value proposition.   Hirscher *et al.* [38],
546 for instance, utilize do-it-yourself (DIY) and do-it-together (DIT) design strategies to design a more
547 sustainable innovative value proposition. Geissdoerfer *et al.* [14], inspired by design thinking,
548 developed the concept of value ideation to design a sustainable value proposition comprising
549 additional values all stakeholders (including society and environment) in the value proposition.
550 Oskam *et al.* [16] propose the concept value shaping to develop financial, social and environmental
551 value that a business create by interacting with the different networks.

552   Studying the role of managers in designing SBMs is a topic has considered in the common area
553   of literature of business and management and business model sustainability. Kurucz *et al.* [21] debate
554   that relational leadership processes that support strongly sustainable organization management help
555   organizations to meet their sustainability ambitious. On the other hand, Stubbs [19] believe that those
556   organizations have embedded the social and environmental concerns in their mission and their
557   purpose have been successful in achieving their SBM goals.

558   The main issue emerged in the application of SBMs in entrepreneurship is that despite there is
559   a remarkable demand on the sustainable businesses, sustainable entrepreneurs are underrepresented
560   [29] and the investors reluctant to invest on the sustainable start-ups, particularly those are
561   environmentally sustainable [29]. Whilst, Davies and Chambers [25] and Gasbarro *et al.* [26] consider
562   business model sustainability innovation as the solution to conquer the barriers to implementing an
563   SBM.

564   Much research is conducted on developing solutions for SBMs to manage the resource and the
565   energy as Moschetti *et al.* [30], Sousa-Zomer and Cauchick Miguel [31], and Zhang *et al.* [32] propose
566   frameworks and approaches to develop SBMs provide values to the energy resources. Rossignoli and
567   Lionzo [33] also recommend partnership networks is a solution that assisting businesses in the energy
568   to provide sustainable value propositions.

569   Pal and Gander [35] also believe that the traditional business models in the fashion industry
570   produce highly negative outcomes for the environment through high water usage, chemical
571   pollutions, and incineration or landfill of a large amounts of unsold stock. Therefore, sustainable
572   business models are considered as a solution to minimize such negative effects. The most prevalent
573   approach in designing a SBM in the fashion industry is to participating the customers in the value
574   creation process [38,39]. On the other hand, Pal and Gander [35] believe that creating value for the
575   customer and environmental and capturing value for the firm is the solution to eliminate the barriers
576   in transition of traditional supply chain toward a slowing and a closing loop of resources and toward
577   a sustainable business model in the fashion industry.

578   The healthcare is another industry utilizes SBMs to achieve sustainability goals. Surprisingly
579   enough, the found articles have used SBMs to address sustainability issues have aided digital
580   technologies. In other words, the common literature of business model sustainability and healthcare
581   are tied with digital technology. As Merchant *et al.* [41] and Anwar and Prasad [42] consider
582   Telemedicine as a solution to design value propositions to develop a sustainable business model in
583   healthcare industry. In addition, Nikou and Bouwman [40] believe that utilizing the mobile
584   technology can design a sustainable business model in the healthcare industry.

585   The supply chain sector is the other sector that is found in the literature which has utilized the
586   principles of the SBM to provide solutions to reach the sustainability development [47]. Ray &
587   Mondal [48], Geissdoerfer *et al.* [49], and Brennan and Tennant [50] argue that collaboration and
588   networks among firms within a closed-loop supply chain (CLSC) leads in sustainable business model
589   in providing benefits to three bottom line concepts of protect environment, improve economic
590   performance, and social performance. Since it the supply chain concept implies B2B relationships
591   between the suppliers and buyer, such networks and collaboration can resulted in quarantinable
592   consumption and according to Witjes and Lozano [47] it reduces the use of raw material and waste
593   generation also. Finding exposes that the Bottom of pyramid has centered in the hotspot of designing
594   SBMs in in develop countries. It is found that SBMs offer solutions such as designing a market-

595   oriented business model to provide win-win solutions for multiple stakeholders. The research in the
596   common field of business model sustainability and hotels, as the most important sectors of hospitality
597   industry, are still in the infancy stage as most of the studies have tried to investigate the sustainability
598   level of the hotels rather than providing solutions for development of a sustainable business model.

599   Illustrating the research path and articulating in detail the application of SBMs in different
600   industries, sectors, and research area are the contributions of this study that provide insights and the
601   possibility of compressions for both practitioners and researchers who are eager to find sustainable
602   solutions through SBMs. Different approach has revealed and to design an SBM and the most come
603   one was designing a sustainable value proposition which is able to provide values to multi-
604   stakeholders such as society and environment while it can be profitable for the organization.
605   Sustainable value creation and value delivering plus B2B partnerships are other solutions have
606   emerged in the literature for developing an SBM.

607   **5. Conclusions**

608   The process of sustainable business model construction forms an innovative part of business
609   strategy. Different industries and business types have utilized sustainability business models to
610   satisfy their economic, environmental and social goals simultaneously. This study is conducted to
611   present the state of the art of sustainable business models in various application areas. The business
612   models are classified and reviewed in different application groups. To do so, a review is conducted,
613   and the findings reveal that the application of sustainability business models can be classified in 16
614   unique categories. The key contribution of this study is providing an insight about the state of the art
615   of sustainable business models in various application areas and its research path. It is found that
616   SBMs offer solutions such as designing a market-oriented business model to provide win-win
617   solutions for multiple stakeholders. The research in the common field of business model
618   sustainability and hotels, as the most important sectors of hospitality industry, are still in the infancy
619   stage as most of the studies have tried to investigate the sustainability level of the hotels rather than
620   providing solutions for development of a sustainable business model.

621   Illustrating the research path and articulating in detail the application of SBMs in different
622   industries, sectors, and research area are the contributions of this study that provide insights and the
623   possibility of compressions for both practitioners and researchers who are eager to find sustainable
624   solutions through SBMs. Different approach has revealed and to design an SBM and the most come
625   one was designing a sustainable value proposition which is able to provide values to multi-
626   stakeholders such as society and environment while it can be profitable for the organization.
627   Sustainable value creation and value delivering plus B2B partnerships are other solutions have
628   emerged in the literature for developing an SBM.

629

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