
Sustainable Digital Innovation – Preconditions and Methods of Integrating Sustainability Aspects into Digitalization

Sascha Stiegler^{1,2}

¹Faculty of Economics and Business Law, University of Siegen, Siegen, Germany

²Department of Economics, Berlin School of Economics and Law, Berlin, Germany

Email address:

stiegler@recht.uni-siegen.de

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Abstract: Sustainability and digitalization have nowadays become core aspects of entrepreneurial actions. In a post-COVID world sustainable solution will be encouraged by incentives and regulations. If businesses want to survive on the market as a progressive company in the long term, they are almost forced to be digitally innovative. Therefore, during the pandemic, many businesses have enforced their investments in sustainable solutions. However, digital innovation activities can only be promising in the long term if they consider sustainable developments and are therefore “sustainable” themselves. Thus, digital innovation and sustainability, in context of entrepreneurial activities and business decisions requires a special approach. As sustainable digital innovation changes the way we are doing business now and in the future, we have gone through contextual settings and how perceived changes will affect businesses, but our approach has been to address the market opportunities. Sustainable digital innovation enables industry to take advantage of opportunities that sustainability concerns bring. Changes in the business environment asks for new solutions and new business approaches. The potential of digital technologies can help business leaders think about managing and re-defining/innovate company’s roles in their business ecosystems. As the market changes and customers and society search for more sustainable solutions new sustainable opportunities arise as we are witnessing dematerialization, servicification and digitalization.

Keywords: Sustainability, Digitalization, Sustainable Development, Digital Innovation

1. Introduction

Both, sustainability and digitalization have nowadays become core aspects of entrepreneurial actions. If businesses want to survive on the market as a progressive company in the long term, they are almost forced to be digitally innovative. However, digital innovation activities can only be promising in the long term if they consider sustainable developments and are therefore “sustainable” themselves.

Thus, both aspects, digital innovation and sustainability, in context of entrepreneurial activities and business decisions requires a special approach. In this regard, the following article is based on the sustainable potential of digital technologies that can help business leaders think about managing and innovate the company’s roles in business ecosystems and how to do this in ways that support both the sustainable development of both businesses and society at large.

2. Relating Sustainable Development and Business Management

During the pandemic, many businesses have enforced their investments in sustainable solutions. In a post-COVID world, sustainable solutions will be encouraged by incentives and regulations [1]. It is therefore valuable to understand the role of leadership at the time of a major crisis with an emphasis on transformation in order to thrive in a more sustainable and digital business context [2].

2.1. Economic Recovery and Sustainable Development in a Post-COVID-19 World

After periods of economic crisis in the past, the political focus has always been to rebuild the old ways of doing business in order to quickly recreate job and kick-start growth

again. However, there has also been a lot of people that argue that the investments in economic recovery should also be used to facilitate and speed-up transformations that in turn would lead to improvements of society. We can see that the recent COVID-19 crisis has already led to some changes [3]. One is the increased use of various digital solutions. As we are planning for economic recovery, many argue therefore, that we should focus on making our ways of working even more digital and thereby more sustainable. Others emphasize the need for new energy infrastructure that can reduce the emissions of greenhouse gases and limit increase of the global average temperature, all in line with the Paris Agreement of 2015 [4]. Given our recent Corona pandemic experience, companies also need to complement their vision with ideas about their preferred role, with scenarios that allow them to prepare for alternative futures.

In a message recorded for the 50th anniversary of Earth Day, UN chief *Antonio Guterres* urged governments to use their economic responses to the coronavirus pandemic to also tackle the planet's unfolding environmental crisis [5]. In turn, the European Commission's Green Deal chief *Frans Timmermans* has assured EU lawmakers that "every euro" spent on economic recovery measures after the COVID-19 crisis would be linked to the green and digital transitions." [6]. The European Commission issued "A Roadmap for Recovery" on April 2021, outlining a recovery plan to help relaunch EU economies, with the intention to build a "more resilient, sustainable and fair Europe". This roadmap clearly emphasized the need for continued efforts to build a more digital, environmentally sustainable and more circular European economy [7].

2.2. Proactive Leadership in a Digital and Sustainable World

The potential of digital technologies can help business leaders think about managing and re-defining/innovating their companies' roles in their business ecosystems [8]. The sustainable benefits of digitalization need to be understood, even if the emissions that correspond to the information and communication technology (ICT) sector stand for approximately 1.4% of the overall global emissions [9]. In fact, the benefits outperform the negative impact as digital solutions can decrease other sectors' emissions by up to 15-20% [10]. There are several important digital trends with lots of opportunities regarding consumption and production, which lead to greenhouse gas emissions. An important perspective also is that the price of climate solutions continues to fall rapidly. The best option for climate is now often cheaper than other alternatives. Markets for clean energy systems, transport solutions, agriculture, buildings, finance and industry are opening up and growing exponentially. This brings opportunities for companies that transform their business models early to become market leaders [11].

2.3. Business Opportunities of Sustainable Development

As customers and society value stimulate and push ways of

working and solutions that are socially and ecologically sustainable, it is getting increasingly important to become more economically sustainable as well [12]. In some industries the adverse direct effects on natural resources in the proximity of the activities related to the value chain they form have been known since centuries. With the growth of the number of people on earth combined with the use of fossil fuels and several new technologies as well as the increased level of material consumption, it has become evident that all parts of business and human society collectively are impacting all parts of our planet and thereby the natural ecosystems and natural processes that are fundamental to all forms of life. Although the human living conditions have improved over the last two centuries, the improvements have resulted in very different levels of change. As the world population has grown from about one billion individuals in around 1800, we are soon to be eight billion people of earth, with a doubling over the last 50 years. These changes raise the question how human societies can continue to develop without losing the capacity of the natural ecosystems to both support and withstand the increasing strain they are under while improving the living conditions in an acceptable way.

For businesses this question has driven collaborative efforts by industries to support a sustainable development [13]. Many have also had to respond to the financial actors' demand for proof that companies not only comply with local environmental and social legislation but also have internal processes to manage their business in an ethical and risk reducing way. These demands are called environment, social, governance (ESG) [14]. In between nations there has been a debate about what can be characterized as sustainable development and there has been a series of summits and initiatives to define and agree on common goals since the 1980s. Most recently the United Nations fostered a process that resulted in the program Agenda 2030 with 17 Sustainable Development Goals published in 2015 [15].

3. Integrating Sustainability into Business Management

As the new business environment emerges, it becomes even more important for businesses to understand what constitutes the existing demands and opportunities and how they evolve because of a more sustainable development. Therefore, In the next chapter, the ongoing changes that affects the business ecosystem are analyzed.

3.1. Drivers and Opportunities Related to Sustainable Development

Today, we are witnessing a massive change in national and global business environments. Customer demand face strategic shift from product to value and usage. Most customers are used to traditional ownership, yet the shift in mindset and habits, in other words, from owning a product to securing access to the value it provides, has clearly began. This shift is not only based on environmental concerns, but

also has an obvious economic benefit for individual customers and for society. Its Impact, which was most limited to the IT industry for more than ten years since software-as-a-service became a common solution for business and customers, has now become tangible in other industries as well. The process to develop value-based offerings is different. As we start from the sustainable value created for the customers, we select segments and assign the offering accordingly, and last, we visualize the value for the customer [16]. It's important to think about what could and should be done, and how far companies should go in the customer decision. As for the digital part of the offering, we can find significant different there as well. In a traditional offering, digitalization is more of an add-on, whereas in a value-based offering, it's often an integrated part of the core and vital for making the offering sustainable, both for, example, predictive maintenance, or by visualization, and testing a digital twin.

Based on both the public and the private pull, the market opens for new market opportunities, which leads to an increased need for new sustainable innovations [17]. These innovations are needed to reduce our carbon footprint, become net positive as well as meet other SDG goals. The interest in new innovations results in both R&D and market investments to meet market needs. A way for companies and organizations to approach the SDGs is to use the so-called SDG Compass, a guide which was developed in 2015 by the Global Reporting Initiative, the UN Global Compact and the World Business Council for Sustainable Development [18]. It provides companies with five steps to maximize their contribution to the SDGs [19].

3.2. How Sustainable Strategies Can Be Integrated in Business Management

There are several management tools and frameworks, which have been developed over the last 40 years and support the integration of sustainable strategies [20]. These have evolved over time due to societal needs and business engagement as the power of the businesses are essential to tackle environmental and global challenges.

Business organizations and business networks, such as the World Business Council for Sustainable Development and The Global Compact, have taken leads in principles and policies for businesses in sustainable development over the last 30 years. The understanding that governments cannot solve environmental challenges by themselves [21], has established a strong position for industries to act for transformation and sustainability. The World Business Council for Sustainable Development was established in 1995 in order to be a business voice into the global conversation on sustainability and environmental issues. It is now a global, CEO-led organization of over 200 leading businesses working together to accelerate the transition to a sustainable world. But it also holds a supportive role for all businesses as they provide a platform for them to respond to sustainability challenges by accelerating business solutions. The Global Compact, the world's largest network for sustainable business,

has largely based its work on the organization's ten principles. But in the wake of the corona crisis and as an adaptation to Agenda 2030, the Global Compact now comes with several new benchmarks for companies' sustainability work. These include an even gender distribution at management level, zero emissions of harmful substances, a positive impact on water, being in line with the 1.5-degree target and eliminating corruption.

3.3. The Critical Role of Performance Indicators

To succeed with digital sustainable solutions, we need to make sure that initiatives as well as change processes are not limited or hindered by our traditional way to run our business. There are various aspirations companies and organizations have on change. It is important to understand them so we can plan and govern transformation. How can we approach these aspirations? We can examine them both from how a company values exploration and exploitation opportunities as well as based on the time perspective their efforts have. Companies and actors view change differently and their organizations are normally structured and adapted with resources, competences and processes to deal with change within a certain risk and time frame [22]. Sometimes organizations deal with both. The way a company decides on the general balance between exploration and exploitation also affects how it plans and wants to achieve short- and long-term goals in its system [23]. The innovation platform goes further and discusses how an organization, or a group of organizations can alter between exploiting and exploring. Anyway, if we want to understand the momentum and the force that can be applied in an action led approach, we also need to understand the basic intentions of the various stakeholders.

An important perspective, which might lead to eventual failures and tensions among cooperating organizations, is the time frames companies plan with. For example, the concept of 'The Three Horizons' was first presented in *The Alchemy of Growth* by *Baghai/Coley/White* in 2000 [24]. It provides a useful taxonomy for innovation and change and describes innovation occurring on three different time horizons: Horizon 1 provides continuous innovation. It is often incremental and supports a company's existing business model and core capabilities. The time frame to leverage in the short term might be from three to twelve months. Horizon 2 explores and sometimes challenges a company's existing business model and core capabilities to new customers, markets or targets. The time frame to leverage in the mid-term might be up to three years. Horizon 3 is more disruptive and supports the creation of new capabilities and new businesses to respond to opportunities or to counter disruption. The time frame to leverage in the long term might be more than three years. The strategy to succeed with Horizon 3 is different than the one with Horizon 1, but these initiatives will occur in parallel. However, the longer horizon demands clearer objectives and a higher capacity to orchestrate your cooperation and ecosystem development.

4. Aligning Sustainability in Industrial Digitalization

Revenues in industrial companies are coming from multiple sources as digitalization and services become even more important. As sustainability becomes more important for customers as well as shareholders and other stakeholders, we must get better at incorporating and aligning sustainability with business offerings.

4.1. Sustainable Value Offerings

There are many innovation opportunities if we focus on sustainable values. Sustainable solutions are often based on circular economy and not on a linear logic [25]. This asks for a change in business models, just as many companies need to question or redesign value-related processes and reduce negative impacts.

Sustainability is to be integrated into business strategy. It is to make sure that it goes into the core of the company and just something you can add on top. We are witnessing digitalization enabled shift to sustainable solutions in various fields. Use solutions will have an effect on how we evaluate offerings in the future. In order to understand the value of an offering, we need to address and reflect on four different value dimensions; value creation, value delivery, value capture, and of course, the customers. With the support of digitalization and for example, machine learning, we can secure higher efficiency. It is to be referred to the remanufacturing of products and components or the recycling of materials. This works very well in some areas, such as newspapers and bottles. But it becomes more and more difficult with additives and products with composite materials, which are more difficult to recycle. There is a problem, for example, with small integrated circuits in electronic appliances and computers, which are very difficult to separate into different materials. Visualize refers to delivering virtually or as a service. There are traditional B2C services such as Spotify, conference calls on Skype, e-books on Kindle. As for B2B offerings, remote monitoring would support a predictive maintenance.

The interest in circular business models is growing and has become an important reference to sustainability work. However, it starts with the design phase, where value is created with a sustainable perspective. For companies, there is a need for setting financial and business objectives as well. This means that solutions need to decouple economic activity from the consumption of finite resources and design waste out of the system [26]. The establishment of solutions that enables companies to take each step to reuse, refurbish, remanufacture or recycle creates new demands on business models, digital support and platforms as well as engages customers in new ways. Inspiration can also be gained from Accenture's definition about the following five alternative business models for achieving competitive advantage [27]. Within this, both digitalization and internet-of-things-solutions are needed to trace and track materials and material flows more easily, more evidently and more measurably. As most solutions are new to

companies, they need to learn how to adapt them to their context.

4.2. Opportunities for Sustainable Development in an Increasingly Digital World

Value is not tied to a product but comes from the usage of a product. Therefore, we can decouple growth and value from using resources, which is clear in many circular business models. Therefore, we need to discuss how the value of services, shared resources and digital solutions can be enhanced [28]. For example, coding has a clear role in the design process for sustainable solutions, but it is also important to have certain aspects in mind: What are the objectives of the solutions? What are these solutions striving for? There are several definitions that all sound positive, such as eco-design and circular design. Still, there are, in fact, clear differences. The guiding principles for eco-design are based on the idea that the products should be waste in the end and the design should prolong each step in the waste hierarchy reuse, recovery, recycling and at last disposal [29]. It does not include and focus on the positive impact of dematerialization and decoupling of the physical product with a value perspective.

For product designers, it is about product integrity, the extent to which a product remains identical to its original state, over time. Circular design principles are first aimed to prevent a product from becoming obsolete and, second, make sure that resources can be recovered with the highest level of integrity [30]. The design for product integrity is an important aspect in circular product design. The product's integrity can be lost if focus is only in designing for recycling (either conventional or bio-cycling).

5. Innovation Through Sustainable Development

As the market changes and customers and society search for more sustainable solutions new sustainable opportunities arise as we are witnessing dematerialization, servicification and digitalization. But to really grasp opportunities, we need to understand the wider system along the current and future value chain.

5.1. Sustainable Innovation Practices

Sustainability changes the business context and how offerings are perceived. Thus, such shift in preferences, which is one of the keys why businesses should not neglect customers, legislators and business that strive for sustainable solutions, and which is also changing market pre-scription and market drivers, is to be addressed. For example, servicification as showing value in use [31]. In this regard, "value in use" discusses new sustainable opportunities available as the interest shifts from the product to the value of the product. Industries and companies are traditionally focused on products. But the value for customers does not only come from the transaction but also from how customers

are supported before and after the transaction as well as from the usage of their product. The shifts from product perspective to service perspective and to focus on value and usage are important parts of a company's ambition to provide decoupled services and solution [32].

Most companies are still product-centric, and therefore, they have challenges on different levels to embrace service strategies as well as sustainable strategies [33]. Reflecting on the differences above and understanding what they base their development interest on help us gain an insight into what kind of sustainable solutions they could be interested in. However, what totally interrupts the product-centric way of thinking is the disturbance of exponential trends – such as digitalization and sustainability. These trends and the new kind of solutions and business models that follow are more service-based solutions, where you decouple the value the product creates from the product itself [34].

5.2. Corporate Strategies for Sustainable Development

Every company should have a business idea, in other words, an overall, long-term goal. Thus, it is to be addressed why business ideas should explain the company's reason to exist and elaborate on the owner's intentions. As businesses strive to deliver sustainable development, there is a need for sustainability to become part of business strategy [35]. In this regard, strategy is, according to *Alfred Chandler*, “The determination of the basic long-term goals and objectives of an enterprise, and the adoption of courses of action and the allocation of resources necessary for carrying out those goals”. In other words, strategy deals with where we are heading and how we get there. But a strategy can also exist on different levels [36]. Strategy on the ecosystem level typically deals with the position and role in the value chain/network as well as alliances, outsourcing partnership and supply chain strategies [37]. On the corporate level, strategy deals with aspects such as what are the synergies, which business units should grow and which should be on hold and how to combine different business areas with different business logics and contexts? The business unit level is an important one for strategy making. A business unit typically has the responsibility for a “business” in terms of revenue and cost. It could therefore be seen as a “small company” of its own.

6. Practicalities of Capturing Sustainable Value

As many companies set up sustainable and circular projects in order to become more sustainable. In the end, this is also a matter of change and transformation of business. Change and transformation, in this regard, is about priorities, and therefore finance is of great importance as we address system transformation and business transformation. Transformation means re-thinking of business models, new partnerships and value constellations as well new models for financial analysis with integrated measures of sustainability and new approaches to investment and financing. In order to disseminate the risk

and get a comparable instrument, the EU has established a ‘Common Taxonomy for Environmentally Sustainable Investment’ as a part of their EU Action Plan for Financing Sustainable Growth. This taxonomy provides the opportunity to identify and compare investments necessary to achieve a sustainable economy [38]. The idea is that it will form the basis for future standards and labelling of sustainable financial products, so investors can relate to the risks involved in each process.

Traditionally, sustainable investments have been seen as any investment. Investors have been uncertain if regulations will change in the future and to what degree. Uncertainty do not support the willingness to invest. But here we are probably witnessing a change. European Commission's new ‘Green Deal’ can be seen as a mediating instrument. A mediating instrument can be seen as a ledger that frame the capital spending decisions of individual firms and agencies, and that help to align them with investments made by other firms and agencies in the same or related industries. This reduces risk for investments and allows capital spending to address and invest in important solutions that can be transformative. We can hopefully make parallel between the Green Deal and the roles of ‘Moore's Law’ and ‘technology roadmaps’ [39]. Moore's law has been powerful for investments in IT to perceive the state of a future market. A clear path reduces investment risks and have led to investors invest in solutions that will be able to position themselves in a future market. The Green Deal can be the same ledger for sustainable change and sustainable transformation as Moore's law has been for new digital solutions.

Another important aspect for transformation is a deep and continuous collaboration between all stakeholders. Here it important as well to understand how different stakeholders are financed on what financial terms they operate. The late business manager *Peter Drucker* said: “Until business returns a profit that is greater than its cost of capital it operates at a loss.” This statement is of great importance to understand in order to develop a deep and continuous collaboration. What financial returns a company in a cooperation need depend on how they are financed in other words what requirements shareholders, banks and other lenders have on the company.

A way to address this is to use the ‘Dupont model’ which illustrates the return of equity for a company. The model breaks down to three parts – profit margin, asset turnover and financial leverage and enables us to understand how business will prioritize different business opportunities. The Dupont model helps us to understand stakeholders' business models and their constraints and could be used as we analyze different transformative opportunities and barriers. For example, asset intense companies such as utility companies to strive for mobility services challenge their way of doing business. This might work for a demonstrator but as we want to scale up the business the utility will need to challenge their traditional business model. They might succeed, but they need to have a great commitment for the urban mobility solution as they will be challenged by their own internal structures.

7. Conclusion

In this article, it was to addresses the two most profound challenges business face today – digitalization and sustainability. As these are changing the way we are doing business now and in the future, we have gone through contextual settings and how perceived changes will affect businesses, but our approach has been to address the market opportunities. Sustainable digital innovation enables industry to take advantage of opportunities that sustainability concerns bring. Changes in the business environment asks for new solutions and new business approaches. The potential of digital technologies can help business leaders think about managing and redefining/innovate company's roles in their business ecosystems [40]. And how to do this in ways that support both the sustainable development of both our business and society at large. In a post-COVID world sustainable solution will be encouraged by incentives and regulations. It is therefore valuable to understand the role of leadership at the time of a major crisis with an emphasis on transformation to thrive in a more sustainable and digital business context. As addressing sustainability based on only on regulations might not lead to competitive advantages. The need gain business advantages as well as profitability requires companies to incorporate sustainability as a central part in their way of doing business.

An important part of integration is to secure sustainable revenue streams. Revenues in industrial companies are to a larger degree coming from multiple sources as services and digitalization becomes even more important. The customer value from sustainability increases as well as expectations from shareholders and other stakeholders. Therefore, products and offering must also align and integrate sustainability. These challenges are opportunities and must be seen as such by the organization, product development and sales. As the market changes and customers and society search for more sustainable solutions new sustainable opportunities arise as we are witnessing dematerialization, servicification and digitalization. But to really grasp opportunities there is also a need to understand the wider system along in current and future value chains.

In this context, research and consulting is only at the beginning on how and, in particular, to what extent sustainability and digitalization can be reconciled on the one hand and complement each other for the benefit of the business on the other. There is no doubt that both aspects are interdependent and the perspective goal should be that they can create added value in relation to each other. Nevertheless, more "best practices" and, if necessary, field trials are needed to be able to make well-founded, case-by-case decisions.

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