

Digital Product Passport in Marketing and the Future of Sustainable Development

Murat Basal¹ , Ahmet Demircioglu² 

¹Vocational School, Istanbul Gelisim University, Istanbul, Türkiye

²Healthcare Management, Istanbul Gelisim University, Istanbul, Türkiye

Email: mbasal@gelisim.edu.tr, ahmetdemircioglu@hotmail.com.tr

How to cite this paper: Basal, M., & Demircioglu, A. (2024). Digital Product Passport in Marketing and the Future of Sustainable Development. *American Journal of Industrial and Business Management*, 14, 759-782.
<https://doi.org/10.4236/ajibm.2024.145039>

Received: April 1, 2024

Accepted: May 26, 2024

Published: May 29, 2024

Copyright © 2024 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

After the digital marketing concept became popular with the spread of the internet in the 1990s, marketing on electronic platforms has developed through the use of all kinds of technological devices. In the last two decades, social media, television, radio channels, SMS, e-mail, search engines, websites, mobile applications, electronic billboards and social networks have brought greater convenience, wider reach, cost-effectiveness and time and distance in digital marketing and provided the ability to transcend boundaries. However, recently artificial intelligence technology has been used in the field of digital marketing. Just as digital products, which are a channel of marketing, offer a wide range of offerings, from software applications and online platforms to multimedia content and digital services, digital consumers have also researched the features and advantages of digital products to understand their nature. With the change of living, economic and climatic conditions, development with the development of time and technological technology, and the increasing uncertainty regarding the future growth of the world economy, the expectations become bleaker. To be able to follow all the life cycle stages of a product, digitalization and modernization of the data related to the product from the four p's of marketing is possible. A new digital format has been created with the concept of passport. Product-related information included in marketing in the Digital Product Passport can be made accessible online via the internet and offline through physical product labels such as QR codes. Innovators are exploring circular business models for sustainable development, focusing on product life cycle extension, design improvement and the development of new models in line with circular economy values. Due to changing living conditions, the impact of materials and products used in all areas, from digital products to digital products, on our lives and environment, monitoring the product from its birth to its introduction to the market, to its disposal after the end of its useful life without harming the environment is

important in preventing waste that will harm the environment. The aim of this study is to provide information that will be useful in knowing the new concepts emerging in the developing world and reducing the impact on the environment by recording the life cycle of the product. In this direction, the study was carried out by conducting research on the necessary skis. With this oriented work, it has become easier for the consumer to access the products. Measures regarding the environmental impact of a product after purchase vary by country. As a result of this study, it is seen as a necessary process because digital tracking of products is mandatory as conscious and environmentally conscious consumers, suppliers or producers affect each other in a chain manner in the digital age. The issue of sustainability is now high on the agenda of the EU Commission. European Green Deal and Circular Economy Action Plan; It paved the way for the development of the Digital Product Passport. The United Nations has set 17 sustainable development goals in the 2030 Agenda.

Keywords

Marketing, Digital Product Passport, Product Lifecycle, Development, Sustainability, Environment

1. Introduction

According to Panza et al. (2023), humans' unsustainable consumption of resources in our world causes various ecological crises. Adopting an absolute environmental sustainability perspective, wherein economies and societies evolve within the world's carrying capacity, is stated as a mandatory requirement for attaining sustainable development. According to Johnson (2023), customers now expect brands to understand their specific preferences, interests, and needs, with tailored recommendations, customized content, and personalized interactions throughout their buying journey. Stratmann et al. (2023) suggest that the Digital Product Passport could be a solution to this problem in marketing, as the necessary product information for creating a circular economy is almost non-existent and even inaccessible. Good governance is crucial for the efficient management of all types of resources, including natural resources, for the well-being of current and future generations. Castro (2022) considers that digital transformation can be a key driver of changes in governments seeking to increase transparency, accountability, and efficiency. The Products Regulation, proposed in the European Commission in March 2022, was the first legislation to establish the European framework for Digital Product Passports. Following digital product passports to make the European Union's production systems sustainable, multiple perspectives need to be taken into account when designing and implementing digital product passports to achieve the overarching goal of sustainable material flows, energy use and reduced emissions. The European Commission proposes the integration of Digital Product Passports to overcome these challenges. This

has facilitated the processes of reuse, repair and recycling. According to Hestad (2023), the European Commission is alarmed that “5 million tons of clothing are thrown away every year in the EU—about 12 kg per person”. Fast fashion is a big problem, just like the extent of misleading assertions regarding the green action, known as greenwashing. In fact, “53% of green claims contain vague, misleading, or unverified information”. In recent years, the issue of sustainability has been high on the agenda of the EU Commission. The development of the Digital Product Passport has been made possible with two major initiatives—the European Green Deal and the Circular Economy Action Plan. The digital product passport allows for monitoring the entire process from product creation to their disposal and even recycling. In this regard, Psarommatis (2024) divided the product life cycle steps into three main groups: the production phase, the product operation phase, and the product circularity phase. The production phase includes all the different production steps until the product reaches the end user and starts running. The operation phase refers to the period during which the product is in operation. In this study, the product circularity phase refers to all stages after the use of the product and includes actions such as reusing or repurposing the product to take full advantage of the remaining lifespan of the products or some of its components, but also the recycling process.

2. Digital Marketing

2.1. The Emergence and Development of Digital Marketing

Digital marketing is the use of websites, apps, mobile devices, social media, search engines, and other digital tools to promote and sell products and services. Digital marketing incorporates many of the same principles as traditional marketing and is often considered an additional way for companies to approach consumers and understand their behavior. Companies often combine traditional and digital marketing techniques in their strategies (Priewe, 2015). However digital marketing also comes with its own set of challenges. Digital marketing started to become popular in the 1990s with the spread of the internet (Barone, 2024). Digital marketing (DM) conceptualizes marketing on electronic platforms through the use of all kinds of technological devices (American Marketing Association, 2021). Over the past two decades, DM has been transforming global marketing through the deployment of electronic media and tools to implement metrics-based, objective, relational, and interactive marketing: Social media, television, radio channels, SMS, e-mail, search engines, websites, mobile applications, electronic billboards and social networks. The adoption of innovative devices and techniques in digital advertising and marketing has provided greater convenience, a wider reach, cost-effectiveness, and the ability to transcend distance and time limits (Gibbons, 2024). Digital marketing uses all types of technologies, including artificial intelligence (AI) and the Internet of Things (IoT), to fulfill marketing goals in both consumer-to-consumer and business-to-consumer settings (Buhalis and Volchek, 2021).

Digital marketing is interactive marketing with customers and business partners using digital information and communication technology and electronic devices; In a broader sense, these are marketing activities that use information technology and digital communications (Gedik, 2020a). Digital marketing or digital promotion has come in handy, and marketers are able to capture consumers' attention more easily. Also, we have automation on a boom, and digital marketing is a highly automated process that reduces a lot of manual processes for both consumers and marketers. Although both traditional marketing and digital marketing are effective in their own way, according to marketing trends, digital marketing is slightly ahead of the traditional method (Thakur, 2023).

Digital Marketing in Small Scale Enterprises

In today's scenario, digital marketing or online marketing is to encourage brands to connect with potential customers using the internet and other forms of digital communication. This includes not only email, social media, and web-based advertising, but also text and multimedia messaging as a marketing channel. Digital marketing and inbound marketing are easily confused, and for good reason. Digital marketing uses many of the same tools as inbound marketing such as email and online content. Both exist to capture the attention of prospects throughout the buyer's journey and convert them into customers. However, the two approaches have different views on the relationship between the means and the goal. Digital marketing considers how individual tools or digital channels can convert leads. A brand's digital marketing strategy can use multiple platforms or focus all their efforts on a single platform. For example, a company may primarily create content for social media platforms and email marketing, while campaigns are being run ignoring other digital marketing avenues.

1) Suggestions

Since social media is the marketing tool of choice, businesses should invest time and resources in building a strong social media presence and engaging with their followers regularly.

Content marketing and brand awareness are popular strategies, businesses can focus on creating engaging and informative content to reach their target audience.

Since the challenge faced by participants is technical issues, it is important to address these issues in order to ensure smooth and effective digital marketing campaigns.

2) Solution

Digital marketing is important as it is in line with how consumers decide on their purchases. An increasing number of consumers are using internet services and research to conduct preliminary studies on the impact of digital marketing on small businesses. People agree that online/digital marketing highly impacts various functions of the business (Vanaja and Kumar, 2023).

2.2. Digital Product and Its Features

A digital product refers to a product or service that exists in a non-physical or

abstract form, mainly based on digital technology. Unlike traditional physical products, which are tangible and take up physical space, digital products are created, distributed, and consumed in a digital environment. This category covers a wide range of offerings, from software applications and online platforms to multimedia content and digital services. To understand the nature of digital products, it's essential to research their features, advantages, and how they compare to traditional physical products. Google Search, Facebook, the Uber app, and the Sonos speaker app are all good examples of digital products. Some exist independently, while others are a digitized form or part of a physical product or business.

Digital products are intangible. However, almost everyone nowadays owns an item that is considered digital products/property, be it music, e-books, or online courses. Due to their widespread appeal and simplicity of distribution, digital objects are becoming the foundation of many entrepreneurs' entire businesses. Other businesses promote them to go along with tangible goods and services (Pimberly.com, 2023).

Digital products have many advantages over their physical counterparts, especially for the entrepreneur who sells them. These are as follows;

- 1) Inventory never becomes a problem (redundancy or deficit).
- 2) You don't have to find a place to store your products.
- 3) Customers can get the product as soon as they buy it in most cases.
- 4) There are no costs associated with materials or assembly (kajabi.com, 2018).

Digital product innovations and digital marketing innovations (i.e., innovations in the distribution, promotion, and price elements of the marketing mix) have enabled firms to compete in fundamentally new ways. Digital product innovations have led to the emergence of many highly successful innate digital or digital-native firms and the reinvention of old firms around the world. Because of near-zero costs of remanufacturing and distributing information products in digital form, innate digital firms in information products industries also tend to be born globally—that is, they become global in a relatively short period of time following the rapid spread and adoption of innovation—and are born inclusive—that is, they serve a large customer base that spans high, middle, and low-income market segments globally (Varadarajan et al., 2022).

2.2.1. Types of Digital Products

Software Applications: This category includes a wide range of applications, from productivity tools such as word processors and design software to entertainment applications such as games and streaming services.

Digital Content: Digital content encompasses a variety of formats, including ebooks, music, videos, and podcasts. Users can access and consume these contents on digital platforms.

Online Platforms: Social media platforms, e-commerce websites, and online marketplaces are examples of digital platforms that facilitate interaction, trans-

actions, and content sharing.

SaaS (Software as a Service): SaaS products offer software solutions over the internet, eliminating the need for users to install, maintain, and update software locally. Examples include cloud-based collaboration tools and customer relationship management (CRM) systems.

Digital Services: Services provided over the internet, such as online education, telemedicine, and digital marketing services, fall into this category.

2.2.2. Features of Digital Products

Intangibility: Perhaps the most defining feature of digital products is their intangibility. They lack a physical presence and are experienced through electronic devices such as computers, smartphones, or other digital interfaces.

Interactivity: Digital products often provide a high degree of interaction. Users can interact with the product, customize settings, and get real-time feedback. This interactive structure sets them apart from many traditional products.

Instant Distribution: Digital products can be distributed instantly over the internet. Users can download software, access digital content, or subscribe to services without the constraints of physical distribution channels.

Scalability: Digital products can be easily scaled to accommodate a growing user base. Once developed, additional users often incur minimal incremental costs, making scalability a notable advantage.

Upgradability: Updates and improvements in digital products can be delivered to users seamlessly. This contrasts with physical products where updates may require replacement or additional components (Productfolio).

While many e-commerce platforms are well-suited for selling physical products and services, there is a big difference between selling physical and digital products online. Some of the key features of an ideal platform are:

- 1) Digital storage
- 2) Shopping cart
- 3) Integrations with the best payment gateways
- 4) No hidden transaction fees (Bigcommerce, 2024).

2.3. Digital Consumer

In the present era, the advancement of technology and the prevalence of social media have increasingly facilitated people in carrying out their various activities, whereas technology has significantly influenced its users in recent times. However, technology has now made its way into education. The learning process is greatly influenced by the use of technology and media by educators in this modern era. The creation of enjoyable learning conditions and a stimulating creativity and learning process for educators can be achieved by specializing in various sciences. At first, learning technology is perceived as a technology that employs equipment, media, and tools in facilities. But learning technology is now both theoretical and practical. YouTube and WhatsApp are two digital products that students frequently use during the learning process. YouTube can make it easier

for students to find video or audio based on the material they desire to learn. YouTube's "Recommendation" feature can make it easier for them because it always provides similar videos or audio recommendations. Students were taught not just how to use digital products, but also about their families and friends by teachers. Students can easily run digital products. Students are greatly benefited by the digital product as it enables them to meet all their learning needs. Teachers and their colleagues can also use digital products to conduct learning activities. "Social Impact" is also one of the factors that make the use of digital products dominant in student learning. The main purpose of students using digital products is to support their academic activities. In addition, students can find new friends and colleagues who work in the same field as them and have a discussion about lessons using digital products (Chairunnisa & Kasriyati, 2021).

Companies can effectively target a large number of potential consumers at the same time through digital marketing. Targeting potential consumers and customers worldwide at once can be accomplished quickly by using the internet channel for marketing. Social Media Marketing has also revolutionized these marketing activities on different social media platforms such as Facebook, Twitter, LinkedIn, Pinterest, etc. (Learn in Digital, 2023). On March 11, 2020, when Minister of Health Dr. FahrettinKoca announced the detection of the first case of the new coronavirus infection in Türkiye, there was a significant shift in digital content consumption habits. As the epidemic became a national issue, worries about public health grew and social mobility also increased (Gedik & Piro, 2022). Consumers can access detailed information about which products, where and at what prices they can buy in the digital realm. This allows them to make purchases without physically visiting stores or engaging in negotiations with sellers. Nevertheless, consumers who are enticed by the convenience of online shopping and the simplicity of payment methods often fall into consumer traps, as they are influenced to buy more products than necessary (Şen, 2020). Digitalization is considered to be one of the most significant elements of our time. The effectiveness of digitalization lies in its ability to permeate many areas of our lives. In recent years, the concept of consumer has been replaced by a new term, which is "digital consumer" (Mesci & Sağlık, 2020).

2.3.1. Features of Digital Consumers

Consumers today carry their internet-connected devices with them wherever they go. It's time to stop relying on TV commercials, billboards, or salespeople for advice on the best products and services. In reality, digital consumers often prefer to do their own product research online. These are respectively as follows;

- 1) Consumers today spend a significant amount of time researching different product categories, brands and services before making a purchase decision.
- 2) A simple interface error, a double-check request via email, or even an out-of-stock product can be enough to lead customers to your competitors.
- 3) Consumers expect high-quality products and services at affordable prices.
- 4) Customers always expect access to products and services, and if it is not

possible, a more capable competitor will always be available to meet their requirements.

5) Technology and social media enable consumers to share their honest opinions and experiences with a broad audience.

6) A gesture of action is often triggered by the emotional state of a buyer.

7) As the urgency of tackling climate change increases, this shift in consumer habits brings environmental concerns to the forefront.

8) Compared to previous generations, consumers today are more informed and use the latest technologies to stay up-to-date on products, services, prices, and competition.

9) If fraud or manipulation is detected in a brand's message, people's trust will be shaken, leading them to easily gravitate towards similar offerings from competitors.

10) Adding new dimensions to the online experience, these new technologies have the ability to recreate elements of the physical world (Juillet, 2023).

In a recent study by Gapingvoid, a consulting and visual communications company, 63% of consumers reported that they may leave brands due to irrelevant content. Successful DPXs guide the customer through the Customer Decision Journey with a story about the product and its unique features. This is supported by relevant messaging and visualizations that are customized for the consumer's current stage of engagement. This messaging can vary in format, ranging from a single product image to interactive applications. An effective digital product experience guides the consumer from identification to becoming a brand advocate (Indg, 2024). For instance, the internet has introduced a new way of doing business and has made it possible to digitize a bunch of old-world products as well as new types of products. Today, if you go to the bookstore to buy the latest Harry Potter, you can only do so on an e-reader or phone (Mighty, 2023).

2.3.2. Understanding Customers in Digital Marketing

The effectiveness of digital marketing strategy cannot be achieved without a clear understanding of who is purchasing the product, and why or where they are purchasing it. To obtain tactical information, data and demographic information are used to create a solid profile of the target audience and follow these steps.

- 1) Define the channels suitable for basic demographic information
- 2) Speak your customer's language
- 3) Understand their pain points and how to open up emotions
- 4) Create buyer personas to help customize content and predict buying patterns
- 5) Be culturally aware
- 6) Consider partnerships as is the case with influencers
- 7) Focus on action-oriented experiences and outcomes rather than the product
- 8) Use automation tools for segmentation and targeting (O'Brien, 2023).

2.3.3. European Commission 3rd Annual Digital Consumer Activity Report

It is emphasized here that a digital asymmetry exists between businesses and consumers, with consumers being nearly powerless against digital service providers due to their dependence on digital services. Consumers often find themselves entangled in digital services that mislead them about how services operate and give the false impression that services are free, even if they are not. When consumers offer value to service providers, it can potentially be considered a transactional decision. It is important to note that consumers should have the right not to be subjected to personalization, or at the very least, to know how the content is personalized (European Commission, 2022).

2.4. Features of Products in Digital Product Perception

A product attribute is a distinct feature or quality of a product that adds value to customers. This may encompass capabilities, design components, or performance enhancements. For product managers, defining and prioritizing the features to be developed is a crucial aspect of their role (Haaff, 2024).

2.5. Digital Product Passport

Product Passports are often used to measure material, energy and resource cycles, making the sustainability aspects of a product lifecycle visible. Product Passports are often framed as a solution to the lack of a consistent and precise flow of information about resources, products, and processes, and lifecycle assessments that act as track and trace tools for unique and pooled product information (King et al., 2023). According to the German Federal Ministry of Environment, Nature Conservation, Nuclear Safety and Consumer Protection and the “Proposal for a New Ecodesign Regulation for Sustainable Products” (ESPR), a DPP contains information about the components and origins of a product, but it should also carry information for environmental and social impact assessment throughout the product’s production, use, and conversion stages. The information can then be used to build circular economy business models (Jansen et al., 2023). The European Commission has set the goal of carbon neutrality by 2050, this will be accomplished by promoting the dual transition to sustainability through digitalization. The cornerstone of this transition is the implementation of a successful Circular Economy (CE). However, the product information needed to create an evolving CE is almost non-existent or even accessible. The Digital Product Passport (DPP) offers a solution to this problem (Stratmann et al., 2023). Digital product passports (DPPs) are an emerging technology and are considered enablers of sustainable and circular value chains because they support sustainable product management (SPM) by collecting and incorporating product lifecycle data (Berger et al., 2023). The term of a Digital Product Passport has been defined as a container that combines various data sets from all lifecycle stages of a product. It creates a new digital format for digitizing and modernizing product data, including statutory and/or voluntary data, to support industry

transformation towards circularity and carbon neutrality. In addition to tracking the lifecycle history of a product, the features of a Digital Product Passport may also include the ability to track it as it moves from one place to another. The information contained in the Digital Product Passport can be made accessible online over the internet and offline through physical product labels such as QR codes (Koppelaar et al., 2023). The Digital Product Passport, as we have defined it, is a container for datasets that can be accessed online or offline through both online and offline access points. The digital product passport is based on a universal product identifier that is linked to a unique internet identity. Various product identification systems, such as legally required product serial numbers and Global Trade Identification Numbers (GTINs), are already common (Nissinen, 2022). In order for Digital Product Passports to be operative, they must be created to uniquely identify products on the internet through a web link or address, utilizing the Uniform Resource Identifier (URI) that underpins the Universal Resource Location (URL). When the product is available on the internet, information about the product can be listed and made accessible in the format of a Digital Product Passport. This opens up opportunities for technical, environmental and circular product information to be available from one central location on the internet. The last consideration is physically tagging the product with linked product identification codes and URIs using a QR code or similar physical data label that contains readable information that a user, such as a collector or recycler, can access through a mobile device (Koppelaar et al., 2023). Based on the life cycle information stored in the DPP, designers and engineers can improve the eco-design features of products such as durability, reliability, reusability, repairability, reproducibility, recyclability, energy use, and waste generated. Manufacturers can provide traceability for warranty claims and recalls, repairers and maintenance services can provide better services through the technical and historical data stored in the DPP, remanufacturers can gain advantages by accessing to information on the dismantling and health status of components, and recyclers will benefit from information on hazardous or valuable substances. The presence of the DPP will benefit end users as it will enable them to make more responsible purchasing choices by visualizing the environmental performance of the product (Panza et al., 2023).

As a DPP system, it connects the product-related information of various actors throughout the life cycle of the product shown in **Figure 1** below. To manage circular product lifecycles, information must be collected from appropriate lifecycle stakeholders (internal or external), managed, and properly transferred to the relevant party for decision-making. The creation and use of product-related information throughout the product lifecycle involves a wide range of actors such as product manufacturers, subcontractors, material suppliers, logistics companies, vendors, end-product users, spare parts and service vendors (Saari et al., 2022). We can divide the product life cycle steps into three main groups: the production phase, the product operation phase, and the product circularity phase. The production phase encompasses all the different steps in

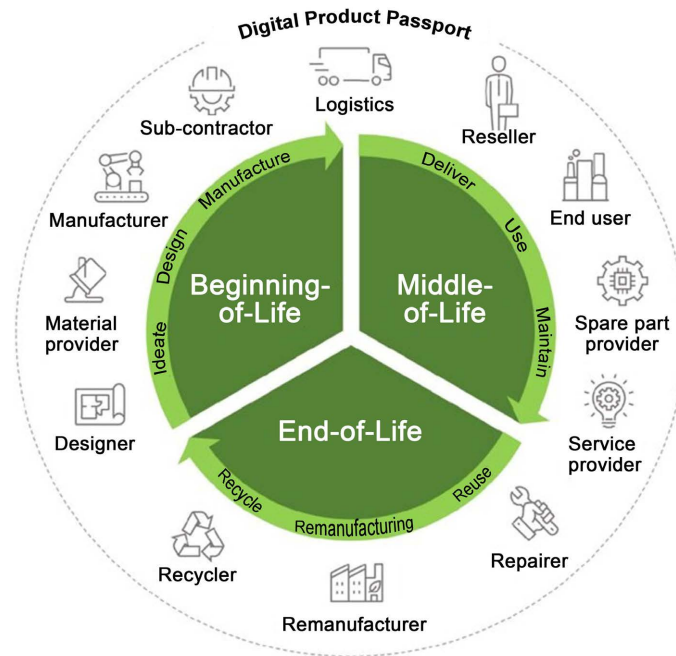


Figure 1. The DPP connects the product-related information of various actors throughout the product's lifecycle.

https://www.researchgate.net/publication/364209085_Digital_Product_Passport_promotes_sustainable_manufacturing

the process until the product is delivered to the end user and begins functioning. The operating phase refers to the period of time during which the product is in operation. The product circularity phase refers to all the stages after the use of the product and includes actions such as reuse or repurposing the product to take full advantage of the remaining useful life of the products or some of their components. This step also includes the recycling process (Psarommatis, 2024). DPP bir while it is EU regulation, its reach will extend far beyond Europe. For example, a global electronics manufacturer headquartered in North America that manufactures laptops in Asia and then sells them in Europe will still need to comply with all relevant DPP regulations. Therefore, it applies to any product bought or sold on the European market. The digital product passport will become a globally valid standard regardless of the product's manufacturing or manufacturer location (Inriver, 2024). On March 30, 2022, the European Commission proposed a Sustainable Products Initiative that would repeal the current eco-design rules, which usually focus on energy-related products. The Sustainable Products Initiative, which introduces more comprehensive rules within the scope of the Circular Economy Action Plan, aims to establish circular economy principles at all stages of production in the EU market and to create sustainable ecosystems within this framework (Yeşilbüyüme.org, 2024).

Features of a Secure Digital Product Identity

A secure Digital ID and associated Product Passport must be able to be checked by everyone in the value chain, including the consumer, to prove the true au-

thenticity of a product. However, this alone is not enough, and security requires considering a wide range of factors. While an app can secure a single product, security involves ensuring the safety of the brand's entire circular ecosystem. In order to guarantee the authentication of only genuine products, it is necessary to issue secure IDs and link them to the products in a carefully controlled manner, and systems must be put in place to ensure that only genuine products are allowed access to a brand's content and services. Still, security is not only in the ability to build a garden with impenetrable walls that guarantee access to original products.

A secure identity application must detect and manage all use cases that the consumer may encounter in the real world. This includes cases of cloned identity, as well as counterfeit marks where counterfeiters will link to the brand's website to deceive consumers that the product is genuine. If Digital Identity lacks the ability to block illegal products and manage the consumer experience at this highly sensitive moment, it puts the brand at risk of losing consumer trust. In fact, a secure identity is designed not only to recognize counterfeit products and clones, but also to increase the rate of seizures of these illegal products, recover stolen sales, and provide data and insights for investigations so that brands can understand the problem and take action against its root cause.

Secure identities prevent illegal products from accessing a brand's services, but more importantly, they are designed to protect and prevent illegal products from polluting the circular ecosystem. Circularity is not only brand-dependent, but also involves a complex network of dealer markets and refurbishment services. Only a secure Digital ID implementation can build trust with the consumer and the marketplace. This will no longer be an optional approach, but it will be one that brands should take, given that US and EU regulations on expanded producer responsibility are coming soon, demanding that brands take measures to protect consumers from fraud.

Securing Digital Product IDs and providing robust product authentication does not depend on a single tagging technology such as NFC, OTP, or underlying identity management technology such as blockchain. In fact, misconceptions about such secure technologies can often lead to unintended consequences. Blockchain can secure a product's digital data in the cloud, but it's not a silver bullet that can secure an authentication app on its own. Its perception as an un-hackable technology can lead brands to implicitly trust blockchain and assume that their applications are intrinsically secure when adopting it. Blockchain is not infallible in verifying physical products. Cloned insecure physical identities can be compared to their records on the blockchain, leading to a false sense of authenticity. Therefore, it is crucial to complement the blockchain with other forms of identity security to secure physical identity in the product itself. NFCs with a One Time Password are generally considered non-clonable in the traditional sense, allowing brands to build a walled garden around their connected services that only provide access to genuine products. While improving security

for one area, this approach prevents brands from seizing, monitoring, and controlling the inevitable market for counterfeit products in the market, resulting in blocking it in another. As mentioned earlier, products will circulate with fake NFCs that simulate the brand's own indecipherable version, and when illicit products can roam untracked, they will inevitably enter the brand's circularity ecosystem.

To summarize, a secure Digital ID or Digital Product Passport is a passport that must be able to prove the authenticity of a product; it is regulated in a controlled manner and associated with the product; it can detect clones and fakes; it manages all consumer use cases; and it protects the circular ecosystem of the brand. Only secure authentication will demonstrate to the consumer and the market that the brand is serious about consumer protection and sustainability (Certilogo, 2023).

3. Development

The concept of development is a difficult one to agree on, not only among theorists working in the field, but also among practitioners working in the field (Turhan, 2020). Development is defined as a dynamic process by which a society moves economically and socially from one state to another. Traditional development was initially defined as Western-style modernization achieved through economic growth under the influence of mainstream economics. In much of the literature, economic growth and development are widely regarded as synonymous. However, the need to redefine the concept of development in a more comprehensive manner has arisen due to the failure of national economic growth policies, which are aimed at increasing production, to solve social and political problems (Akin, 2022).

Due to shifts in life, economic and climatic conditions, the passage of time, and advancements in technology, the notion of development and its level of importance have also evolved, so it is considered as a concept that progresses over time (BemYacoub, 2022).

The literature on development economics has been aware of theorizing cultural and social arrangements since the 1950s, and it can be stated that it has a different position from mainstream economics. Over time, development economics has become one of the areas most affected by this trend, and topics that were previously considered non-economic have increasingly been included in this field (Derici, 2020).

A development strategy is an economic understanding that outlines priority objectives, explains how the set goals can be achieved in a coherent manner, identifies policy instruments, and considers trade-offs and timeframe. It can be described as a vision with normative goals, taking into account what is feasible and balanced. Such a strategy doesn't necessarily have to be explicit; rather, it may be implicit in the mindset of policymakers or the implicit agenda of governments. In addition, it does not have to be comprehensive, but it should ad-

dress the main problems in the medium and long term. Overall, the positive developments in the economic and social indicators of developing regions necessitate two fundamental qualities. Firstly, following the financial crisis, there has been a more uneven growth in emerging and transition economies, resulting in bleaker prospects due to increased uncertainty regarding the future growth of the global economy (Calcagno, 2015).

Development can be divided into seven categories:

- 1) Human development
- 2) Social development
- 3) Cultural development
- 4) Economic development
- 5) Physical development
- 6) Political development
- 7) Regional development (Özhan & Keser, 2021).

In Türkiye, the 1961 Constitution deemed it necessary to create a development plan to ensure the economic, social and cultural development of the country. The National Planning Institution, which is responsible for the preparation of development plans, was established on September 30, 1960 as an institution affiliated to the Prime Ministry (Batuhan & Kodaz, 2020).

3.1. Sustainable Development

The term sustainable development was adopted in the report “Our Common Future” (known as the Brundtland Report) of the United Nations Commission on Environment and Development (WCED), chaired by Gro Harlem Brundtland, Norway. Improvements aim to develop the present without jeopardizing the ability of future generations to meet their own needs (Gedik, 2020b).

The concept of sustainable development has become a reference for scientific research on the environment and has acquired the character of a paradigm for development. Since the Rio de Janeiro Earth Summit, as mentioned in the Brundtland Report in 1987, the concept has become hegemonic and has been incorporated into international treaties and national constitutions and laws of many countries around the world. It has also been used in business-related issues, agricultural production, industry and urban development have become the conceptual basis of theoretical approaches such as the green economy. It has even become part of the common sense of a large part of the world’s population and the political slogans of environmental defense (Ruggerio, 2021).

Sustainable development is a concern and challenge of modern societies in developing and developed countries. Good governance is crucial for the efficient management of all types of resources, including natural resources, for the well-being of current and future generations. Digital transformation can be a key driver of changes in governments looking to improve transparency, accountability, and efficiency (Castro, 2022).

Human activities are causing various ecological crises, mainly due to the un-

sustainable use of the planet's resources. To achieve sustainable development, it is necessary to adopt an absolute perspective of environmental sustainability, where economies and societies thrive within the earth's carrying capacity (Hau-schild et al., 2020). EU Ecological Design for Sustainability The Products Regulation legislation, proposed by the European Commission in March 2022, is the first legislation to establish the European framework for Digital Product Passports (European Commission, 2022). Following DPPs as the most promising approach to make the European Union's production systems sustainable, multiple perspectives need to be taken into account when designing and implementing DPPs to achieve the overarching goal of sustainable material flows, energy use, and reduced emissions. There is a global imperative to transform our economies away from their damaging past and into a regenerative future, and DPPs are likely to be the cornerstone of this transformation (Langley et al., 2023). The fashion industry plays a significant role in contributing to global carbon emissions and environmental degradation. However, a problem arises when basic information about the product is lost after consumers acquire clothing, hindering progress towards a circular economy. To overcome these challenges, the European Commission is proposing the integration of Digital Product Passports (DPPs). This facilitates reuse, repair and recycling processes (Herzele et al., 2023). The European Commission is alarmed that 5 million tons of clothing are thrown away every year in the EU, averaging 12 kg per person. Fast fashion is a big problem, as is the scope of false claims about the green act, known as greenwashing. In recent years, the issue of sustainability has been high on the agenda of the EU Commission. The European Green Deal and the Circular Economy Action Plan have laid the foundation for the development of the Digital Product Passport (Hestad, 2023). The integration of circular economy principles into mainstream business strategies is gradual. Innovators are exploring circular business models. The focus is on extending the product life cycle, improving design, and developing new models in line with circular economy values. While some quality characteristics, such as longevity, have been identified, other important considerations, such as repairability and maintenance, require a broader industry focus to fully realize a circular economy (Pimvenders, 2024). The introduction of the Digital Product Passport offers companies the opportunity to produce, use and recycle their products in a more sustainable way. A high degree of data transparency allows for efficient use of valuable resources, resulting in significant cost savings. Based on this, innovative business models can be developed that ensure a good position in the competitive market. Finally, by using DPP, companies reduce CO₂ emissions and thus make a significant contribution to climate protection (Dangl, 2023). Sustainable development is a fundamental principle of the Treaty on European Union and a priority objective for the EU's domestic and foreign policies. The United Nations 2030 Agenda includes 17 Sustainable Development Goals (SDGs):

Sustainable Development Goal 1: No poverty

Sustainable Development Objective 2: Zero hunger

Sustainable Development Goal 3: Health and well-being
Sustainable Development Goal 4: Quality education
Sustainable Development Goal 5: Gender equality
Sustainable Development Goal 6: Clean water and sanitation
Sustainable Development Goal 7: Affordable and clean energy
Sustainable Development Objective 8: Decent work and economic growth
Sustainable Development Goal 9: Industry, innovation and infrastructure
Sustainable Development Objective 10: Reduced inequalities
Sustainable Development Goal 11: Sustainable cities and communities
Sustainable Development Objective 12: Responsible consumption and production
Sustainable Development Goal 13: Climate action
Sustainable Development Objective 14: Life below water
Sustainable Development Objective 15: Life on land
Sustainable Development Objective 16: Peace, justice, and strong institutions
Sustainable Development Goal 17: Partnerships for the goals ([Sustainable Development Goals, 2024](#)).

3.2. Some Country Profiles Regarding the Sustainable Development Goals

- **Germany:** Germany focuses on promoting responsible supply chains (SDG 12), optimal social and environmental standards (SDG 3), climate change mitigation and adaptation (SDG 13), and conservation of natural resources (SDG 15) (Federal Republic of Germany, 2016). Life below water (SDG 14) is another priority area for the country ([SDG Germany, 2020](#)).
- **Albania:** EU accession is Albania's top priority and most important strategic goal. By developing the European integration process as a driving political and development objective, the Republic of Albania is well on its way to achieving the SDGs ([SDG Albania, 2020](#)).
- **Austria:** In May 2020, Austria submitted an SDG VNR to the UN. Climate action is one of the top five topics featured in the main messages of Austria's VNR. While addressing the SDGs in their environmental dimension, Austria also focuses on water management (SDG 6), energy efficiency (SDG 7), sustainable agriculture (SDG 2) and forestry (SDG 15) ([SDG Austria, 2020](#)).
- **Belgium:** Belgium focuses on all the SDGs, working on inclusive strategies and initiatives to address linkages and improve cooperation within and between various governments. SDG actions in Belgium are a shared responsibility between the federal state, communities (Flemish, French and German speaking) and regions (Wallonia, Flanders and the Brussels Capital) ([SDG Belgium, 2020](#)).
- **Bulgaria:** Bulgaria has adopted an approach that considers the interconnectedness of the SDGs across the entire government. By concentrating on the 10 SDGs that encompass environmental aspects, Bulgaria is making progress in promoting SDG initiatives (SDG 2, 3, 6, 7, 8, 11, 12, 13, 14 and 15) ([SDG](#)

Bulgaria, 2020).

- **Denmark:** Denmark's action on the SDGs, which has an environmental dimension, focuses on SDGs 2, 3, 6, 7, 8, 9, 12, 13, 14 and 15 (SDG Denmark, 2020).
- **France:** France acknowledges that social inequalities go hand in hand with environmental inequalities. Therefore, public policies in France are designed to reduce exposure to risks and hazards such as pollution, extreme weather events and natural disasters (SDG 3, 13), tackle fuel poverty (SDG 7) and facilitate access to nature for all (SDGs 3, 14 and 15). With regard to environmental protection, other areas of action include combating climate change (SDG 13), ensuring the green energy transition (SDG 7) and sustainable urbanization (SDG 11) (SDG France, 2020).
- **Ireland:** Ireland's actions on the SDGs, which have an environmental dimension, focus primarily on SDGs 3, 7, 12, 13 and 14 (SDG Ireland, 2020).
- **Italy:** Organised in five key areas (people, planet, prosperity, peace and partnership), Italy has set priorities in each to achieve the SDGs. Italy's actions towards the SDGs, which have an environmental dimension, prioritize SDGs 2, 6, 9, 11, 12, 13, 14 and 15 (SDG Italy, 2020).
- **Liechtenstein:** Liechtenstein highlights areas that require further action in its VNR in 2019. These include reversing the high reliance on fossil fuels (SDG 7), reducing the resource intensity of consumption and production (SDG 12), meeting the greenhouse gas emissions reduction targets (SDG 13), addressing high-level motorized private transport (SDGs 9 and 11) and reversing endangered biodiversity (SDG 15) (SDG Liechtenstein, 2020).
- **Norway:** Sustainable natural resource management and climate change mitigation and adaptation are priority areas for Norway. It has set several targets that pose challenges, including sustainable consumption and production, improving urban air quality (SDG 11), halving food waste and reducing waste generation (SDGs 12, 3), and mitigation of invasive alien species (SDG 15) (SDG Norway, 2020).
- **United Kingdom:** The UK takes a holistic approach to all 17 SDGs. The country's actions towards the SDGs, which have an environmental dimension, mainly focus on SDGs 2, 6, 7, 11, 12, 13, 14 and 15 (SDG United Kingdom, 2020).
- **Türkiye:** Türkiye takes a holistic approach to the SDG actions and integrates them into NDPs and sectoral strategies. Therefore, the country takes care to consider the linkages between the SDGs, as well as prioritize action and allocate appropriate resources for faster progress. Türkiye's actions towards the SDGs, which have an environmental dimension, primarily focus on SDGs 2, 7, 9, 11, 12, 13, 14 and 15 (SDG Türkiye, 2020).

Environmental economic problems such as the recent economic crisis and climate change highlight the importance of concepts like green growth, green economy, low-carbon economy, sustainable production, and sustainable consumption within the framework of sustainable development. International or-

ganizations such as the OECD and UNEP define the concept of “green growth” or “green economy” as an approach that emphasizes the investment and consumption of goods and services that contribute to environmental improvement. From this point of view, it contributes not only to environmental sustainability, but also to economic development, income growth, employment and poverty reduction (Republic of Türkiye, Presidency of Strategy and Budget).

4. Discussion and Conclusion

As the number of digital marketing platforms has grown, so too have the demands and requirements to satisfy customer expectations. The store in physical shopping is comprised of products and a customer representative, while in digital marketing, a website should have a user-friendly interface, have strong product management, use secure payment gateways for payment in shopping, allow ratings and reviews after the purchase of the product, score the seller profiles and their success be monitored by the customer, have licensing options for the website, allow wish list and the creation of favorite lists for customers, create searches and filters, and provide after-sales customer support, and these are among the important functions.

The Sustainable Products Initiative, which introduces more comprehensive rules within the scope of the Circular Economy Action Plan, aims to establish circular economy principles at all stages of production in the EU market and to create sustainable ecosystems within this framework. [Saari et al. \(2022\)](#) argue that in order to effectively manage the circular product lifecycle, it is necessary to collect the information from the right lifecycle stakeholder (internal or external), manage and transfer the information to the appropriate party for decision-making, create and use product-related information throughout the product lifecycle, and involve a wide range of actors such as product manufacturers, subcontractors, material suppliers, logistics companies, vendors, end-product users, spare parts and service vendors. For example, a global electronics manufacturer headquartered in North America that manufactures laptops in Asia and then sells them in Europe will need to comply with all regulations regarding the digital product passport. Therefore, regardless of the product’s origin or manufacturer’s location, the digital product passport should become a globally accepted standard.

Throughout the product life cycle, it is evident that issues related to data security in the digital product passport will arise, including hacking, cloning, and the vulnerability of physical identities. In addition, there are problems that may occur in cases such as mixing records in the loop. As a result, strong forms of identity security should be used to protect the physical identity within the product and prevent it from being modified, hacked, or cloned by third parties.

NFCs with a One Time Passcode, as an example, are generally considered non-clonable, allowing brands to build a walled garden around their connected services that only provide access to genuine products.

When we look at similar studies in this field;

According to the study of Singh (2023), digital consumers have increased in the field of digital marketing, but website interfaces must be user-friendly enough and personal lists must be created. On digital platforms, educators use technology and media in a very important way in the learning process. There is no need for TV commercials, billboards or salespeople for products and services. Digital consumers often prefer to do their own product research online. In this process, digital platforms should be interfaced for easy use for users, a licensed and secure web service should be provided, and customers' expectations and needs should be met. Customers can easily obtain information about products, services, prices and competition, but in terms of reliability against fake and false information regarding the specified product information, having approved or licensed sellers will be reliable for the customers receiving the service.

For Digital Product Passports to be used actively, there is a need to develop products in a way that makes them uniquely identifiable on the internet through a web link or web address. According to Saari et al. (2022), more comprehensive rules need to be introduced in the marketing of sustainable products. In cyclical product lifecycle management, all stakeholders such as product manufacturers, subcontractors, material suppliers, logistics companies, vendors, end product users, spare parts and service vendors should be included in the process. Various security vulnerabilities will arise when using a digital product passport, such as changing and copying data. According to Certilogo (2023), products can be recorded and tracked with a digital product passport, but it would be useful to use NFC tags to prevent security vulnerabilities such as changing or cloning of this data by third parties.

In order to ensure a sustainable environment in which economies and societies develop, sustainable development must be adopted. According to Castro (2022), Sustainable development is a concern and challenge for modern societies in developing countries. Good governance requires efficient management of all resources, including natural resources, for the well-being of current and future generations. According to Dangl (2023), companies reduce CO₂ emissions with the Digital Product Passport and thus make a significant contribution to climate protection.

Recently, issues such as economic crisis, climate change and environmental problems have been on the agenda in the world. For this reason, concepts such as green growth, green economy, low carbon economy, sustainable production and sustainable consumption are discussed within the framework of sustainable development. The United Nations 2030 Agenda, 17 Sustainable Development Goals have different focuses according to countries.

For example:

The UK takes a holistic approach to all 17 SDGs. The country's actions towards SDGs, which are the environmental dimension, are mainly SDG 2 (No hunger), 6 (Clean water and sanitation), 7 (Accessible and clean energy), 11 (Sustainable cities and communities), 12 (Responsible consumption and produc-

tion), While focusing on 13 (Climate action), 14 (Aquatic life), 15 (Life on land), smaller countries such as the Republic of Albania have moved towards achieving the SDGs, developing the European integration process as a driving political and development goal.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- Akın, C. S. (2022). Kalkınma ve Sürdürülebilirlik. *Research Gate*, 3, 11-22.
- American Marketing Association (2021). *What Is Digital Marketing?*
<https://www.ama.org/topics/digital-marketing/>
- Barone, A. (2024). *What Is Digital Marketing?*
<https://www.investopedia.com/terms/d/digital-marketing.asp>
- Batuhan, T., & Kodaz, İ. (2020). On Birinci Kalkınma Planında Kentleşme Çevre Politikaları. *Şehir ve Medeniyet Dergisi*, 6, 77-94.
- BemYacoub, S. (2022). Yeşilİslami Finansve Sürdürülebilir Kalkınma. *Dergipark*, 8, 11-25.
- Berger, K. et al. (2023). Confidentiality-Preserving Data Exchange to Enable Sustainable Product Management via Digital Product Passports—A Conceptualization. *Procedia CIRP*, 116, 354-359. <https://doi.org/10.1016/j.procir.2023.02.060>
- Bigcommerce (2024). *How to Sell Digital Products Online: Discovering the Right Product, Platform and Strategy*.
https://www.bigcommerce.com/articles/ecommerce/selling-digital-goods/#h2_the_final_word
- Buhalis, D., & Volчек, K. (2021). Bridging Marketing Theory and Big Data Analytics: The Taxonomy of Marketing Attribution. *International Journal of Information Management*, 56, Article ID: 102253. <https://doi.org/10.1016/j.ijinfomgt.2020.102253>
- Calcagno, A. (2015). *Rethinking Development Strategies after the Financial Crisis*. Unctad.org, 1.
- Castro, C. (2022). Digital Government and Sustainable Development. *Journal of the Knowledge Economy*, 13, 880-903. <https://doi.org/10.1007/s13132-021-00749-2>
- Certilogo (2023). *The Characteristics of a Secure Digital Product Identity*.
<https://discover.certilogo.com/blogs/insights/the-characteristics-of-a-secure-digital-product-identity>
- Chairunnisa, S., & Kasriyati, D. (2021). Students' Perceptions of Using Digital Product in English Class Activities at SMAN 3 Pekanbaru. *ELT-Lectura*, 8, 157-167.
<https://doi.org/10.31849/elt-lectura.v8i2.7567>
- Dangl, A. (2023). *The Digital Product Passport as a Bridge between Digitization and Sustainability*.
<https://www.fabasoft.com/en/on-proceco/news/digital-product-passport-bridge-between-digitization-and-sustainability>
- Derici, N. (2020). SivilToplum, Yönetişimve Kalkınma. *Dergipark*, 4, 227-248.
<https://doi.org/10.36484/liberal.679412>
- European Commission (2022). *Proposal for Ecodesign for Sustainable Products Regula-*

tion.

https://environment.ec.europa.eu/publications/proposal-ecodesign-sustainable-products-regulation_en

European Commission (2023). *3rd Annual Digital Consumer Event*.

https://commission.europa.eu/document/download/0080d3f0-c436-495a-8828-01ddca89fe33_en?filename=Report%20-%203rd%20Annual%20Digital%20Consumer%20Event%20website.pdf

Gedik, C. A., & Piro, M. (2022). Salgın Sonrası Yeni Gerçeklikle Yüzleşmek: Dijital Tüketicilerin Değişen Tepkive Uyum Süreçleri. *TAM Akademi Dergisi*, 1, 140-160.

Gedik, Y. (2020a). Pazarlamada Yeni Bir Pencere: Dijital Pazarlama. *Dijital Çağda İşletmecilik Dergisi*, 3, 63-75. <https://doi.org/10.33712/mana.706162>

Gedik, Y. (2020b). Sosyal, Ekonomik Ve Çevresel Boyutlarla Sürdürülebilirlik Ve Sürdürülebilir Kalkınma. *Dergipark*, 3, 197-215.

Gibbons, M. (2024). *150 Fresh Marketing Stats for 2024*.

<https://www.webfx.com/blog/marketing/marketing-stats/>

Haaff, B. (2024). *How to Define Product Features (plus, Templates You Can Use)*.

<https://www.aha.io/roadmapping/guide/requirements-management/what-are-product-features>

Hauschild, M. Z. et al. (2020). Absolute Sustainability: Challenges to Life Cycle Engineering. *CIRP Annals: Manufacturing Technology*, 69, 533-553.

<https://doi.org/10.1016/j.cirp.2020.05.004>

Herzele, C. V. et al. (2023). *Designing a Product Service System for Digital Product Passport in the Fashion Industry in Compliance with the European Commission's Ecodesign for Sustainable Products Regulation*.

<https://biblio.ugent.be/publication/01H8KZ4M1X93ZK63Y1R3Y06M96>

Hestad, B. (2023). *Digital Product Passport: A Sustainable Revolution (2023 Guide)*.

<https://www.bluestonepim.com/blog/digital-product-passport>

Indg (2024). *An Introduction to Digital Product Experiences*.

<https://indg.com/introduction-digital-product-experiences/>

Inriver (2024). *Digital Product Passports: The Journey to Sustainability*.

<https://www.inriver.com/resources/digital-product-passport>

Jansen, M. et al. (2023). Stop Guessing in the Dark: Identified Requirements for Digital Product Passport Systems. *Systems*, 11, Article No. 123.

<https://doi.org/10.3390/systems11030123>

Johnson, C. (2023). *Marketing Challenges of the Future & How to Prepare*.

<https://www.semetrical.com/future-marketing-challenges>

Juillet, R. (2023). *The Evolution of Digital Behaviors*.

<https://www.bocasay.com/evolution-digital-behaviors/>

kajabi.com (2018). *17 Digital Products You Can Sell Online*.

<https://kajabi.com/blog/what-is-a-digital-product>

King, M. R. N. et al. (2023). A Proposed Universal Definition of a Digital Product Passport Ecosystem (DPPE): Worldviews, Discrete Capabilities, Stakeholder Requirements and Concerns. *Journal of Cleaner Production*, 384, Article ID: 135538.

<https://doi.org/10.1016/j.jclepro.2022.135538>

Koppelaar, H. E. M. et al. (2023). A Digital Product Passport for Critical Raw Materials Reuse and Recycling. *Sustainability*, 15, Article No. 1405.

<https://doi.org/10.3390/su15021405>

Langley, D. J. et al. (2023). *Orchestrating a Smart Circular Economy: Guiding Principles*

- for Digital Product Passports. *Journal of Business Research*, 169, Article ID: 114259. <https://doi.org/10.1016/j.jbusres.2023.114259>
- Learn in Digital (2023). *Challenges and Opportunities in Digital Marketing*. <https://medium.com/@snehajohny6833/challenges-and-opportunities-in-digital-marketing-36b372f8c082>
- Mesci, G., & Sağlık, E. (2020). Sağlık Turizminde Dijital İletişim: JCI Akreditasyon Belgesini Almış Hastaneler Üzerinde Bir Araştırma. *Journal of Hospitality and Tourism Issues*, 2, 74-90.
- Mighty (2023). *A Beginner's Guide to Digital Products*. <https://www.mightynetworks.com/resources/digital-product>
- Nissinen, A. (2022). C Make Carbon Footprints Available—And It Is Not Just One Value. *Cleaner Logistics and Supply Chain*, 3, Article ID: 100023. <https://doi.org/10.1016/j.clscn.2021.100023>
- O'Brien, C. (2023). *What Are the Most Effective Digital Marketing Strategies?* <https://digitalmarketinginstitute.com/blog/what-are-the-most-effective-digital-marketing-strategies>
- Özhan, M., & Keser, Y. (2021). Bölgesel Kalkınma ve Yönetişim. *Dergipark*, 6, 19-36.
- Panza, L. et al. (2023). Integrating Absolute Sustainability and Social Sustainability in the Digital Product Passport to Promote Industry 5.0. *Sustainability*, 15, Article No. 12552. <https://doi.org/10.3390/su151612552>
- Pimberly.com (2023). *What Is a Digital Product?* <https://pimberly.com/blog/what-is-a-digital-product/>
- Pimvendors (2024). *Understanding the DPP's Role in a Global Circular Economy*. <https://pimvendors.com/understanding-the-dpp-s-role-in-a-global-circular-economy/>
- Priewe, J. (2015). Seven Strategies for Development in Comparison. *Unctad.org*, 1, 27-43.
- Psarommatis, F. (2024). Digital Product Passport: A Pathway to Circularity and Sustainability in Modern Manufacturing. *Sustainability*, 16, Article No. 396. <https://doi.org/10.3390/su16010396>
- Ruggerio, C. A. (2021). Sustainability and Sustainable Development: A Review of Principles and Definitions. *Science of the Total Environment*, 786, Article ID: 147481. <https://doi.org/10.1016/j.scitotenv.2021.147481>
- Saari, L. et al. (2022). *Digital Product Passport Promotes Sustainable Manufacturing*.
- SDG Albania (2020). *SDGs and the Environment*. <https://www.eea.europa.eu/themes/sustainability-transitions/sustainable-development-goals-and-the/country-profiles/albania-country-profile-sdgs-and>
- SDG Austria (2020). *SDGs and the Environment*. <https://www.eea.europa.eu/themes/sustainability-transitions/sustainable-development-goals-and-the/country-profiles/austria-country-profile-sdgs-and>
- SDG Belgium (2020). *SDGs and the Environment*. <https://www.eea.europa.eu/themes/sustainability-transitions/sustainable-development-goals-and-the/country-profiles/belgium-country-profile-sdgs-and>
- SDG Bulgaria (2020). *SDGs and the Environment*. <https://www.eea.europa.eu/themes/sustainability-transitions/sustainable-development-goals-and-the/country-profiles/bulgaria-country-profile-sdgs-and>
- SDG Denmark (2020). *SDGs and the Environment*. <https://www.eea.europa.eu/themes/sustainability-transitions/sustainable-development-goals-and-the/country-profiles/denmark-country-profile-sdgs-and>

- SDG France (2020). *SDGs and the Environment*.
<https://www.eea.europa.eu/themes/sustainability-transitions/sustainable-development-goals-and-the/country-profiles/france-country-profile-sdgs-and>
- SDG Germany (2020). *SDGs and the Environment*.
<https://www.eea.europa.eu/themes/sustainability-transitions/sustainable-development-goals-and-the/country-profiles/germany-country-profile-sdgs-and>
- SDG Ireland (2020). *SDGs and the Environment*.
<https://www.eea.europa.eu/themes/sustainability-transitions/sustainable-development-goals-and-the/country-profiles/ireland-country-profile-sdgs-and>
- SDG Italy (2020). *SDGs and the Environment*.
<https://www.eea.europa.eu/themes/sustainability-transitions/sustainable-development-goals-and-the/country-profiles/italy-country-profile-sdgs-and>
- SDG Liechtenstein (2020). *SDGs and the Environment*.
<https://www.eea.europa.eu/themes/sustainability-transitions/sustainable-development-goals-and-the/country-profiles/liechtenstein-country-profile-sdgs-and>
- SDG Norway (2020). *SDGs and the Environment*.
<https://www.eea.europa.eu/themes/sustainability-transitions/sustainable-development-goals-and-the/country-profiles/norway-country-profile-sdgs-and>
- SDG Türkiye (2020). *SDGs and the Environment*.
<https://www.eea.europa.eu/themes/sustainability-transitions/sustainable-development-goals-and-the/country-profiles/turkey-country-profile-sdgs-and>
- SDG United Kingdom (2020). *SDGs and the Environment*.
<https://www.eea.europa.eu/themes/sustainability-transitions/sustainable-development-goals-and-the/country-profiles/united-kingdom-country-profile-sdgs>
- Şen, T. (2020). Krizin Dijital Tüketimde Tüketici Satın Alma Davranışına Etkisi. *New Media*, 4, 69-78. <https://doi.org/10.17932/IAU.EJNM.25480200.2020.4/1.69-78>
- Singh, H. (2023). *Essential Features for Digital Product Marketplace Website*.
<https://www.linkedin.com/pulse/essential-features-digital-product-marketplace-website-singh/>
- Stratmann, L. Hoeborn, G., Pahl, C., & Schuh, G. (2023). Classification of Product Data for a Digital Product Passport in the Manufacturing Industry. In D. Herberger, M. Hübner, & V. Stich (Eds.), *Proceedings of the Conference on Production Systems and Logistics: CPSL 2023-1* (pp. 448-458).
<https://www.repo.uni-hannover.de/handle/123456789/13573>
- Sustainable Development Goals (2024).
https://commission.europa.eu/strategy-and-policy/sustainable-development-goals_en
- Thakur, M. (2023). *Traditional Marketing vs Digital Marketing*.
<https://www.educba.com/traditional-marketing-vs-digital-marketing/>
- Turhan, Y. (2020). Kalkınma Kavramının Tarihsel Süreci Ve Etimolojik Analizi. *Uluslararası İktisadi ve İdari İncelemeler Dergisi*, 3, 149-164.
<https://doi.org/10.18092/ulikidince.719140>
- Vanaja, K., & Kumar, V. A. (2023). A Study on Impact of Digital Marketing on Small Scale Enterprises in Coimbatore City. *International Research Journal of Modernization in Engineering Technology and Science*, 5, 2582-5208.
- Varadarajan, R., Welden, R. B., Arunachalam, S., Haenlein, M., & Gupta, S. (2022). Digital Product Innovations for the Greater Good and Digital Marketing Innovations in Communications and Channels: Evolution, Emerging Issues, and Future Research Directions. *International Journal of Research in Marketing*, 39, 482-501.

<https://doi.org/10.1016/j.ijresmar.2021.09.002>

Yeşilbüyüme.org (2024). *Sürdürülebilir Ürün İniyatifi*.
<https://yesilbuyume.org/surdurulebilir-urun-inisiyatifi/>