

THE INTERNET-BASED BUSINESS MODELS AND THE FACTORS DRIVING THEIR SUCCESS

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The fast growth of the Internet, along with improvements in information technology, has changed the landscape of businesses during the last several decades. Several Internet-based firms were able to grow into today's worldwide behemoths by capitalizing on these advancements. However, the success of these companies may be attributed not only to the technological innovations they pioneered, but also to the innovation of their business models. This inspires us to explore the factors driving these Internet-based enterprises, which have allowed them to develop swiftly and maintain strong market positions. The findings of our thorough literature study highlight certain crucial aspects that underpin these Internet-based business models. These are as follows: value proposition and target market, product-market fit, distribution, network effects, revenue models, and the role of technologies (cloud computing and recommendation systems) in enhancing business models.

Keywords: Internet-based businesses; Viral growth; Business model innovation, e-business, Internet

1. Introduction

As a critical resource for companies to update their capabilities and grow their enterprises, the Internet continues to grow and evolve. According to INSIDER Intelligence's eMarketer Research, Global ecommerce sales are expected to total \$5.545 trillion worldwide in 2022 [eMarketer (2021)]. And the number is anticipated to rise in the next years reaching the \$7.385 trillion mark by the end of 2025 [eMarketer (2021)], demonstrating that e-commerce is becoming a more profitable alternative for enterprises. Furthermore, in 2021 online-sales accounted for 19.6% of total worldwide retail sales [Daniela Coppola, (2022)]. That was, roughly one-fifth of every dollar spent on retail products was spent online. Young companies like eBay and Amazon have seen amazing success, demonstrating the Internet's promise. Not only e-commerce firms, but also firms operating in other sectors like LinkedIn for recruitment, Netflix for video streaming, Spotify for music, and Uber for mobility, just to name a few, are software-and Internet driven enterprises.

Many of these well-established and dominant tech businesses were former information technology startups who owe their success not only to their innovative products and technologies, but also to their innovative business models. These were the unique ones, who combined their innovative technologies with their impactful business models [Hoffman and Yeh (2018)].

Although, Chesbrough [2010] argues that the same technology bundled with two distinct business models will yield two different economic outcomes. According to him, "*a mediocre technology pursued within a great business model may be more valuable than a great technology exploited via a mediocre business model*" [Chesbrough (2010, p. 354)]. In the same context, Teece [2010] notes that great technological achievements commonly fail to achieve commercial success because innovators pay less attention to designing adequate

business models. Hence, through the survey of existing literature, we intend to study the effect of combining product innovation with business model innovation, leading to the company's success.

Taking Google, for example. Its founders Larry Page and Sergey Brin developed an algorithm called "PageRank" to efficiently rank web pages using the link structure of the web [Varian (2006)]. Certainly, this innovative technology allowed people with a great tool to facilitate their information search through the web. But at the same time, Google had to come up with ways to monetize their search engine which was free for the user. The goal was later realized when they combined their product with a strong source of advertising revenue. This approach of placing Internet ads based on their quality and relevancy to users' queries, and not just based on how much advertisers pay to post an ad, became the basis behind Google's multibillion dollar business [Schmidt and Rosenberg (2014); Varian (2006)].

Above discussions suggest that a mere product/technology innovation is not enough, but rather it must be bundled with a suitable business model in order to succeed in the market. Unfortunately, there is no universally accepted definition of the term 'business model' in academic literature [Teece (2010)]. But to put it simply, a firm's business model reflects the processes by which it creates and delivers its products or services to intended customers and generates profits, creating value for both the customers and the firm [Björkdahl (2009); Björkdahl and Holmén (2013)]. And its innovation happens when one or more of its elements is/are reinvented to deliver value to a customer in a new way(s) [Lindgardt *et al.* (2009)].

As we know that technological improvements over time have created lots of possibilities that were not previously possible. So, the importance of technology still cannot be ignored, but the real value creation occurs when innovators take advantage of technology innovations to construct effective business models [Hoffman and Yeh (2018)]

Considering the importance of the business model innovation, the objective of this article is to study business model components in Internet businesses. We study the factors that comprise Internet-based business models, how they work, and why they are important. It should be noted that the focus of this article is on B2C (Business to Customer) products or services. By surveying existing literature, we discuss the following components in the context of Internet products/services:

- Value proposition and target market
- Product market fit
- Distribution
- Network effects
- Monetization
- Technologies – Cloud computing and recommendation systems

2. Value Proposition and Target Market

According to Simon-Kucher and Partners, 72% of all new products fail to deliver on their expectations. But it does not have to be this way [Simon-Kucher and Partners (2014)]. The Customer Value Proposition (CVP) has a major role to play in conveying how a company intends to give value to its customers and thereby attracting customers [Payne *et al.* (2017)]. Hence, this phase of this article offers a comprehensive review of the CVP along with a case study to imply the importance of CVP in an Internet-based business model.

Now, before we get into determining the value proposition for a business model, let us first identify and understand a firm's customer and its target market, which are essential part of a business model.

2.1. Target Market

Not everyone is a potential customer, so it's critical to establish a clear target market early on. A target market is a group of people to whom a firm wants to offer products or services. Each category can be subdivided into subgroups. Age, geography, money, and lifestyle are commonly used to divide segments [Weinstein (2013)]. The

first stage in establishing a target market is to determine essential features such as demographics, psychographics, and the products or services that the target market desires and values [Curtis and Allen (2018)]. Evaluating each facet of a consumer's profile aids firms in identifying market demands or gaps.

2.2. Why to determine a target market?

Understanding the target market is beneficial not only during the product creation process, but also throughout the implementation of marketing plans and the selection of relevant sales channels. A complete image of a firm's target market can help conduct effective and focused advertising, cater to most valued clients, build new items that meet customer wants, identify acceptable outlets for products and provide services that support market needs/demands [Weinstein (2013)].

2.3. Value Proposition

The term "Value Proposition" was first coined by Moore [G. Moore (1991)]. The idea he proposed to evaluate the value proposition of a company included three elements:

- Who your target customers are?
- What product or service you are going to provide? And
- Why should a customer purchase from you instead of your competitors with the similar offering?

The literal definition of a value proposition is a promise of value to be delivered, it is the primary reason a customer should buy from you.

According to the Simon-Kucher and Partners, customers do not care about seven out of ten new products introduced to the market [Simon-Kucher and Partners (2014)]. Hence, done correctly, a value proposition can give businesses a huge advantage over your competitors. More importantly, the value/product proposition needs to be well aligned with the targeted audience. This alignment builds the basis for the product-market fit which we discuss in the next section.

2.4. What product or service you are going to provide?

It is important to consider the point of view of the target audience and be able to explain the firm's services or products in a way to appeal to them. Often, even if a firm offers exactly what the customers are looking for, if a firm is not clear in its value proposition, potential customers can look elsewhere [Barnes *et al.* (2009)]. Thus, it is very important to think about the target customers and their needs to make sure the value proposition addresses their needs.

2.5. Why should a customer purchase from you instead of your competitors with a similar offering?

The most essential part of a value proposition is its unique selling point that separates a firm from its competitors. It is highly likely for Internet-based business models to have competitors offering similar products or services. To have a better understanding of one's value proposition, the following questions are proposed:

- What are your competitors lacking?
- What do you do better?
- Why do these differences matter to your customers?

2.6. The 4C Internet business model typology by Wirtz *et al.* [2010]

Now focusing on the Internet-based business models, Wirtz *et al.* [2010] created the 4C typology intended to be straightforward, covering most classical business activities on Internet markets. The framework defines four

basic types of Internet business modes, namely: Content, Commerce, Context, and Connection. The following diagram inspired from Wirtz can help classify the 4Cs along with their definitions and their respective value

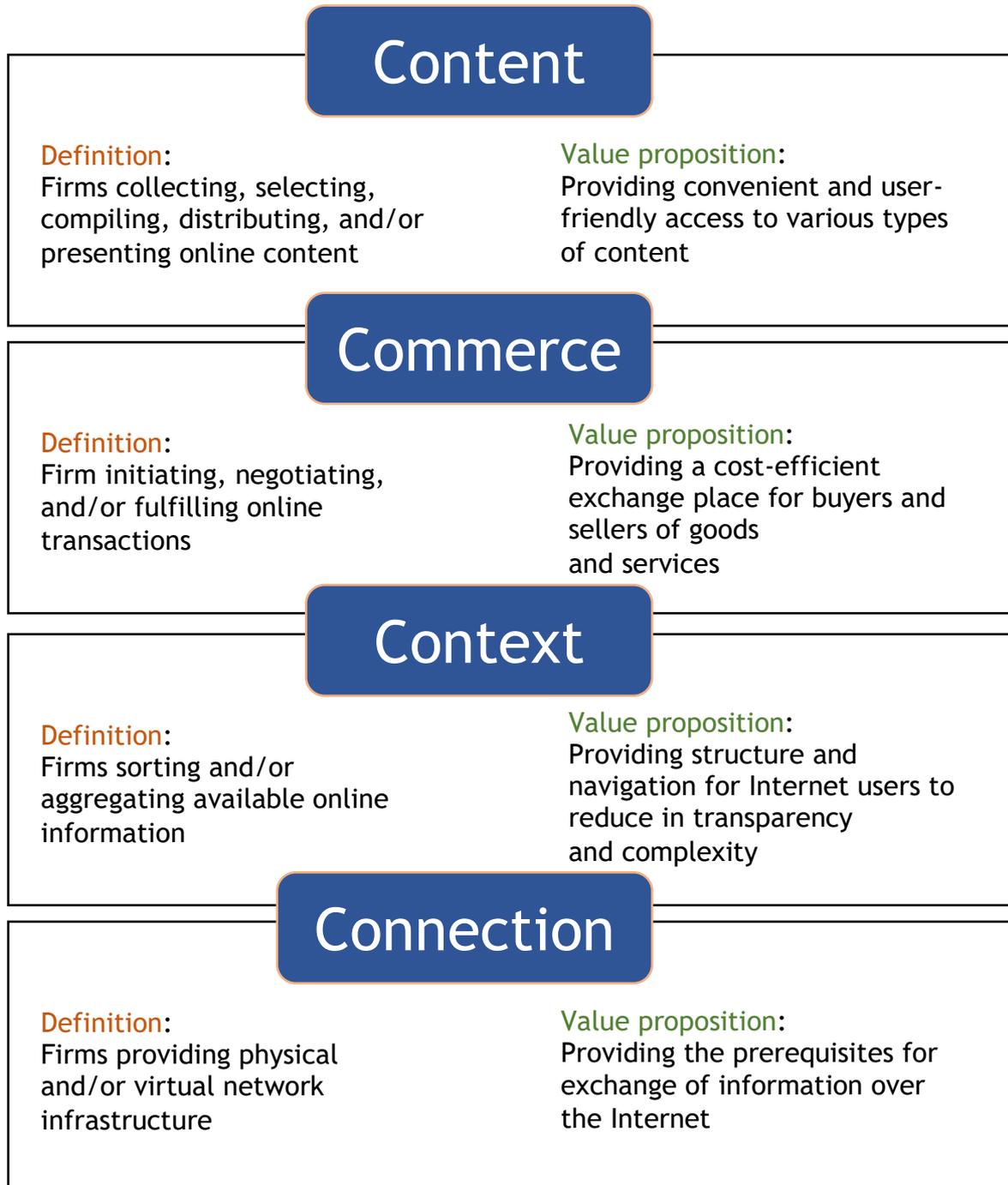


Figure 1 The 4C Internet business model typology inspired by Wirtz *et. al.* [2010]

propositions: [Wirtz *et al.* (2010)]

Based on preceding discussion, now let us take a look at an example by illustrating the customer value proposition of the U.S. multinational mobility as a service provider, Uber Technologies Inc.

2.7. The company

Uber is a rapidly growing U.S. multinational mobility as a service provider that, connects drivers and riders using information technology which now operates in over 900 metropolitan areas worldwide. In the second quarter of 2021, Uber had 101 million monthly active users worldwide with a 68% market share for ridesharing [Uber Technologies (2021); Erick Burgueño Salas (2021)]. Uber's mission is: "*We imagine the way the world moves for the better*". Uber is successful in its market segment by offering a value proposition that attracts both customers and suppliers.

Its Value Proposition:

Uber's success is based on its two distinct value propositions, one to the driver and the one to the rider. Its business model depends on attracting and matching customers and suppliers, while it provides the platform [Kalanick (2013)].

For the rider

Uber offers the convenience with its proposition "*one tap and anywhere*". Customers can call a ride by using an app and pay with their pre-registered credit card/payment method. They can also choose the level of luxury by the choosing the car they would like to ride with.

For the driver

Uber offers a platform and an opportunity of earning to the driver through its platform. To obtain a customer, the driver uses an app to access trip requests. Then the Uber platform guides the driver to the customer's pick-up location. On completion of one trip, the driver has the option to avail the next available trip request again through the app.

After every journey, the rider and the driver have the opportunity to rate their experiences, which helps process the ratings. Uber also prioritizes personal safety with a 24/7 support center.

2.8. Chapter summary

The case of Uber Technologies Inc. shows how a good value proposition can contribute to the company's success and can also lead to major changes in its market segment. Also, having a clear value proposition helps attract potential customers and to differentiate a firm from its competitors.

Next, we'll see how during the hunt for product-market fit, the principle of testing, learning, and pivoting by experimenting can help analyze the "*fit*". Companies must have both the "*fit*" and the correct business model to be able to thrive and survive. Having a clear value proposition together with a "product-market fit" can help achieve these goals.

3. Product-Market fit

Above, we discussed the role of the target market and value proposition as business model elements. Yet, aligning those in appropriate positions is especially crucial for a product or service to become successful in the market. As we mentioned above, this alignment builds the basis for the product-market fit. In his blog post "*The only thing that matters*", Marc Andreessen describes the product-market fit as "*being in a good market with a product that can satisfy that market*" [Andreessen (2007)]. It indicates whether a product is useful and well accepted in the chosen market.

According to Blank [2020], finding such a match between a product and its potential market requires a deep understanding of specific needs of targeted users, users' willingness to pay, and how well the product/service solves its purpose. Thus, it is highly essential to validate the assumptions about the proposed problem and product by communicating with potential users and learning from them as early as possible. This is an iterative process, which needs entrepreneurs to receive feedback from potential users and adjust the product accordingly, until it matches user expectations [Blank (2020)].

For that reason, today's successful entrepreneurs had to figure out ways to learn about their targeted audience early enough by getting the product into the hands of real users. These entrepreneurs had to learn quickly from their potential adopters and update their value/product proposition in order to satisfy user needs.

The case of Dropbox, a cloud-based file storage and synchronization service, provides an adequate example. After building a working prototype, it was necessary to validate demand and test the functionality of the service. To fulfill this task, Dropbox founder Drew Houston created a screencast containing a short demonstration of the service and its features and posted it on Hacker news, a popular online forum for developers. Indeed, this step turned out to be very useful as it let the team receive quick feedback from potential users, while building the service. In addition, the co-founders conducted beta testing [Eisenmann *et al.* (2014)]. It is a test that aims at validating user acceptance where an almost finished product is given into the hands of real targeted users to assess its performance before launch [Babich (2019)]. As an attempt to attract beta testers, Houston posted another video containing a short demo on Digg to target tech-savvy audience. Surprisingly, at this stage, the number of private beta participants climbed from 5k to more than 70k overnight, indicating that early adopters were interested in trying Dropbox [Eisenmann *et al.* (2014)].

Above steps helped the Dropbox team to gain insights into what potential adopters wanted and the required changes to the service to match their needs. One of them was building a Linux version that was created in response to the feedback from beta users. Without these steps, it would have been hardly possible for Dropbox to find its right product-market fit.

As a result, reaching the product-market fit can drive the adoption and strengthen usage, whereas the lack of it may lead to a failure [Andreesen (2007); Hoffman and Yeh (2018)]. Thus, as Andreesen [2007] argues, most of the successful startups are those who reach the product market fit, while others fail because of not ever finding the right product-market fit.

4. Distribution

After the product-market fit, the distribution innovation appears to be one of the key innovation points of software and Internet-enabled business models. For software- and Internet businesses, building great products has been a challenging and crucial task. Yet, in order to build a growing and scalable enterprise, getting users has been equally important as well. As a consequence, to tap into larger markets, a firm needs to design creative ways to distribute its products [Hoffman and Yeh (2018)]. In this section, we discuss some of the most common ways employed by Internet companies to generate users and sell their products.

A distribution channel describes the link between a company's value proposition and its targeted customer segment. Specifically, it allows firms to reach customers and deliver value [Osterwalder and Pigneur (2003)]. In other words, a distribution model describes how the marketing and sales of a product/service offering are organized. The aim here is to recognize the sellers and marketers for a product/service [Rajala *et al.* (2003)]. Product delivery to a customer can take place either directly or indirectly. **Direct distribution** occurs when a company directly sells products or services to its end customers, while **indirect distribution** occurs when a company relies on channel partners or other intermediaries to deliver products to customers [Osterwalder and Pigneur (2003)]. For instance, most traditional manufacturers have been relying on indirect channels that include a chain of multiple participants to take the product from factory to end customer. This chain may look like:



Figure 2 Salesforce [Salesforce.com (n.d. a)]

In some cases, traditional manufacturers may also utilize a direct channel in that they sell their products via their own outlets [Salesforce.com (n.d. a)].

These distribution chains still exist today, but the Internet has transformed the ways how businesses market, sell, and deliver their products, along with methods of communication with customers. Earlier, software companies had to bear the costs of packaging, retail, and shipment for software products. But the emergence of the Internet has removed many of these costs relating to sales and distribution, allowing firms to deliver the software via the Internet without any gate keepers [Wasserman (2011)]. Consumers can access media content like newspapers, films, music, books, etc. in a matter of seconds. In e-commerce, direct distribution takes place through one's own website, and indirect distribution by relying on third party online-retailers [Salesforce.com (n.d. a)]. Similarly, an application can be sold through one's own websites or via virtual application stores like Google's and Apple's App stores.

This way, the Internet has allowed today's dominant tech companies to design effective strategies to reach new users and deliver products. Hoffman and Yeh [2018] point out two significant patterns of distribution that were incorporated by many software/Internet businesses, and which are still relevant today: Utilizing existing networks and viral distribution. The former can be further classified into *piggybacking* and *channel partnerships*.

4.1. Utilizing existing networks

Piggybacking

Many modern businesses used this strategy either in their initial phase or later to gain additional users for their products. Piggybacking refers to targeting the user base of an already established or a growing network to attract those users to participate in your network [Parker *et al.* (2016)]. A well-known story in this context is of Airbnb. In its initial phase, Airbnb gained attention of homeowners by connecting to users on Craigslist (Craigslist is a website which offers online classified advertising services). At that time, many property owners were intending to rent out their properties on Craigslist. And Craigslist had something that Airbnb did not have, which were their listers. Airbnb encouraged those listers to post their properties on Airbnb. This was achieved by building a bot (a software tool to invite hosts on Craigslist to join Airbnb). The tactic resulted in users of Craigslist also posting their properties on their platform. Later, the growth of Airbnb was further strengthened because the listings on Airbnb became superior to those on Craigslist. Besides, charging lower fees increasingly incentivized hosts to list their properties on Airbnb [thesuccessbug.com (n.d.)].

PayPal also leveraged a similar strategy by connecting to eBay's user base. eBay was already a leading online auction platform with a massive user base, and PayPal needed a way to distribute its payment service. eBay's own payment system 'Billpoint' was not simple to use. And eBay's users were individual buyers and sellers who did not have a facility to process and receive payments. PayPal offered eBay participants an instant and secure payment system, making it simple to carry out transactions. PayPal developed a software tool that displayed "Pay with PayPal" icon on eBay. Solving this problem turned out to be very effective as eBay users increasingly started using PayPal, and it soon became the principal payment method on eBay [Chaudhary (n.d.); Hoffman and Yeh (2018)].

Similarly, modern social networking or blogging sites have been leveraged by many Internet companies to bring users to their platform. YouTube was able to grow by enabling video sharing on Myspace, Flickr gained traction by offering a tool for sharing pictures on the Blogosphere, and there are many more companies that used piggybacking [Chaudhary (n.d.)]. Chaudhary [n.d.] implies that this strategy appears to be the key to some of the biggest accomplishments in the Silicon Valley.

Channel partnerships

It appears that some companies utilize existing networks through channel partnerships. A channel partnership allows a company to tap into the customer base of another company or even to enter a new market [Ross *et al.* (2001)].

For instance, Zynga, a social game developer, could gain a rapid and wide distribution by partnering with Facebook. As a social game maker, the partnership allowed Zynga to distribute its games within a large community of Facebook users. According to Kevin Werbach, a Wharton legal studies and business ethics professor, this kind of distribution has become possible with the rise of digital platforms that not only sell their offerings to customers, but also provide infrastructure to other businesses [Wharton (2011)].

Netflix is another instance with a strong partner network. Along with its innovation in streaming distribution, the company is building partnerships to deliver its content to broader audiences. In an effort to grow its subscriber base, Netflix is increasingly partnering with cable operators and Internet service providers. Since 2016, the firm has already entered agreements with some of the largest cable providers in the United States, Comcast, and Cox Communications, for example. With these partnerships, Netflix is aiming at bundling its content with cable services, and both participants are likely to profit from them. That kind of strategy shall allow Netflix to deliver its content to new consumers, mainly long-time Pay-TV subscribers. While cable providers can retain their subscribers that would otherwise migrate to streaming services. Importantly, Netflix is leveraging the same strategy to reach new audience outside the United States [Vena (2018)].

In several cases, leveraging existing networks also generates value for the underlying networks. As the example of PayPal shows, facilitating trades on eBay through the instant payment system created value for eBay users [Chaudhary (n.d.); Zott and Amit (2012)].

4.2. Viral Distribution

Another substantial way to distribute an Information/Internet product is through virality. Viral distribution occurs when own customers act as marketers to spread the word of mouth about the product to potential customers, who bring more customers, and this cycle continues. The term originates from the viral spread of an infectious disease. Many of the Internet-based software applications or platforms were able to get traction by going viral [Parker *et al.* (2016)]. Moreover, viral distribution is observed to often complement the growth through other networks, accelerating further growth [Chaudhary, n.d.]. For that reason, viral products are designed explicitly to get shared amongst peers [Aral and Walker (2011)].

Take Dropbox. Its rapid user growth is mainly credited to its viral distribution. Earlier, the company used Google's AdWords to acquire users through paid search advertising and attempted to seek a partnership with a PC security software provider. However, both strategies did not work well. Later, the company decided to focus on achieving organic viral growth. And indeed, the service was able to grow rapidly, reaching 200,000 users just 10 days after launch. More specifically, the word of mouth and viral marketing efforts contributed to the vast majority of these users [Eisenmann *et al.* (2014)].

4.3. Easy to understand products

An important factor to harness viral growth appears to be an easy-to-understand/easy-to-use product. Generally, people tend to abandon using complex products or switch to other products if they do not understand them. Companies that build easy-to-use products are more likely to scale their business models quickly [Stampfl *et al.* (2013)]. Dropbox had a relentless focus on ease-of-use and reliability of the service. To get an idea of how to improve product features and make the service easy-to-use, the Dropbox team closely communicated with users. They launched a forum called ‘Votebox’ on their website, which allowed users to vote and provide opinions about new features they would like to see [Eisenmann *et al.* (2014)].

Airbnb, as a two-sided marketplace, also offers an easy-to-use service to both the guests and hosts. For hosts, the company makes it easy to list properties by providing a step-by-step process to create listings. In addition to this, Airbnb assists hosts in terms of improving the quality of their listings and guides them to set adequate prices based on market insight. On the other side, the platform facilitates the accommodation search and booking process for its guests. It also takes care of financial transactions by offering a range of secure payment solutions to guests and paying hosts on time [Reinhold and Dolnicar (2017)].

Social networking sites represent another classic example. They are built to inherently attain virality. Facebook made it easy for users to invite people from their contact lists to join the service [Aral and Walker (2011)]. LinkedIn built a tool to connect to user’s Outlook addresses, which made it simpler for existing users to bring their Outlook contacts to LinkedIn [Hoffman and Yeh (2018)]. Similarly, WhatsApp enables users to send invitations via SMS, email, or Facebook.

4.4. Incentive mechanisms

Organic growth via word of mouth is said to get further accelerated by providing incentives that can either be monetary or non-monetary. PayPal designed a two-sided incentive mechanism whereby an existing user got \$10 to refer the service to a new user, and the new user received \$10 as well [Hoffman and Yeh (2018)]. Dropbox leveraged the same incentive structure by offering 250 MB of additional usage, on the top of 2 GB free account storage, upon new sign up [Eisenmann *et al.* (2014)]. Likewise, Airbnb introduced a referral system and offered credits for guests, as well as hosts if they referred somebody to the platform [thesuccessbug.com (n.d.)]. It is necessary to underline, though, that providing monetary incentives may drain cash. In contrast, despite of non-monetary incentives, they also are associated with expenses, which encourage users to use their service even more or repeatedly engage in transactions [Parker *et al.* (2016)].

4.5. User retention

According to Hoffman and Yeh [2018], to harness viral growth, it is also crucial to focus on user retention. Only sign-ups or downloads are not enough, but active usage and user commitment indicate true customer adoption. In other words, acquired users should be encouraged to return and keep engaging in the service. The user base won’t grow if new users join the service and quit shortly [Hoffman and Yeh (2018); Parker *et al.* (2016)]. That is the reason why firms need to develop effective interaction and communication processes. Communicating with existing users helps a firm to improve the product and develop tools that enhance its utility. Besides, interaction orientation helps them to learn from users and figure out ways to satisfy their changing needs [Wirtz *et al.* (2010)]. Again, in Dropbox’s case, as noted, the team could gain significant insights into users’ experiences about the service through support forums. They also conducted occasional usability tests to validate whether users were able to operate the application. Over time, the team incrementally improved the service in response to user requests to ensure ease-of-use. Also, adding enhanced features, such as password-protected shared folders helped them accelerate organic adoption [Eisenmann *et al.* (2014)]. Further considering retention, Wirtz *et al.* [2010] find

the importance of personalization in improving retention. More details on personalized suggestions are discussed in the last section of this article.

Furthermore, it is worthwhile mentioning that getting the product-market fit right might play a critical role in kick starting viral adoption. When a product solves its purpose for targeted users, they understand and get enough value from it and spread the word about their experience, thereby motivating other users to try the product [Andreesen (2007)].

Now before closing this section, it is essential to highlight that strong viral adoption of a product is later supported by network effects that make the product increasingly valuable [Aral and Walker (2011)]. These effects create a positive feedback cycle in which the increasing adoption of a product enhances the value of the product, and the increasing value drives subsequent adoption [Shapiro and Varian (1999)]. We shall see in the coming section how network effects work and enhance the utility of many Internet products.

5. Network effects

Another key characteristic of many Internet-based business models is the network effects they generate. A wide strand of literature has addressed the role of network effects, also known as ‘network externalities’, in fueling and sustaining the growth of numerous information/Internet enterprises [Amit and Zott (2001); Buxmann *et al.* (2015); Stampfl *et al.* (2013); Varian (2017)]. It turns out that network effects have a substantial impact on the scalability of Internet business models [Stampfl *et al.* (2013)]. Now, to understand how firms and their business models leverage network effects, we first need to see how they function.

In practice, companies only benefit from positive network effects. A product exhibits positive network effects when its utility increases for potential users, the more users adopt it [Varian (2017)].

Metcalf’s law is a useful way of illustrating how network effects work. The law indicates that the value of a network goes up in a non-linear way as the number of participants to the network grows [Shapiro and Varian (1999)]. Metcalf’s law is often illustrated for physical networks such as telephones. If there is only one telephone, the utility of the device is zero. But as additional telephones are connected, it becomes useful to each one in the network. So, 2 telephones make 1 connection possible. Similarly, with 5 telephones 10 connections. With 10, 45 connections, and with 100 telephones, there can be 4950 possible connections [Parker *et al.* (2016)]. In parallel, the phone company will have enough money to expand the network, if enough people buy the service [Warrillow (2015)].

In effect, network effects generate value for participants in a network, as well as for those who operate the network. The above mechanism shows that the utility of the service rises nonlinearly, the more people join a telephone network. Also, it is evident that the utility depends on the size of the network, not just on the product itself.

5.1. Scale economies

One key aspect of network effects is reflected in the demand-side scale economies. In traditional industry, the unit cost of production decreases with the increasing number of units manufactured. These manufacturing-based scale economies are known as supply-side economies of scale. Industries of the industrial age have exploited supply-side economies of scale where larger firms tended to have lower unit costs. Supply-side scale economies gave industry giants of that time a cost advantage that was immensely difficult for competitors to attain [Shapiro and Varian (1999)].

By contrast, companies in the Internet age leverage different economics acting on the demand-side. The growth of these businesses has been largely driven by demand-side economies of scale in form of network effects [Parker *et al.* (2016)]. These are particularly pronounced in the networked economy where participant networks are important. According to Varian [2017], the demand-side scale economies exist when the value of adopting a service to an incremental user is higher, the larger the network is. As a result, network effects lead to increased value through higher adoption of a product, making larger networks more valuable than smaller ones [Shapiro

and Varian (1999)]. In the presence of demand economies of scale, the benefit of a service/product is determined by the community of participants who use it. Hence, while the competitive advantage in traditional industries is through cost benefits, in network effects businesses, ecosystems of users are a new source of competitive advantage. Companies, such as WhatsApp, Facebook, and Airbnb became highly valuable because of the massive user bases they created through network effects [Parker *et al.* (2016)].

The research by Libert *et al.* [2014] suggests that businesses built around network effects, which they call “*network orchestrators*”, generate substantially more value compared to other forms. The authors classify various businesses into four categories namely: asset builders, service providers, technology creators, and network orchestrators. See Libert *et al.* [2014] for more details. Their results report that network orchestrators achieve considerably higher compound annual growth rates and average profit margins than other business types. Authors justify that by declining marginal costs with a growing participant network. Since the value in a network is created by participating users on behalf of the company, it reduces a company’s marginal cost.

Despite their value-enhancing effect, network effects do not follow the same dynamics for all products or services. Rather, they can take direct, indirect, or two-sided forms.

5.2. Direct network effects

Direct network effects arise when the value of a good or technology increases with the increasing user base [Sundararajan (n.d.)]. More importantly, direct network effects increase the value for users on the same side. As we already discussed, communication networks exhibit direct network effects. Similarly, these are present in social networks. For instance, Facebook and WhatsApp exhibit strong direct network effects. The value of Facebook, as a social networking site, rises with every additional user [Stampfl *et al.* (2013)]. Likewise, it is valuable to use WhatsApp when people you want to reach also use it. So, the service yields higher utility if more people from your contacts join it.

5.3. Indirect network effects

Indirect network effects arise when the increasing adoption of a product leads to an increase in the production of complementary goods, which in turn, increases the value of the original good [Sundararajan (n.d.)]. For instance, users will be drawn to an operating system with lots of compatible applications, and developers create applications for operating systems with lots of users [Varian (2018)]. This example indicates that a widely used operating system may result in an increase in the availability of compatible applications (complementary products), which further increases the demand for that operating system through improved benefits.

5.4. Two-sided network effects

This kind of network effects exhibits a distinct character. More specifically, two-sided network effects are present in two-sided markets in which participants on two different ends of the market attract each other. Therefore, two-sided network effects exist when the value of a service for participants on one side depends on the number of participants on another side. Two-sided platforms, such as e-commerce marketplaces or matching services generally display this form of network effects, connecting participants from both sides. A common feature of these platforms is that they create infrastructure and set rules for governance, which enable transactions between two user groups [Eisenmann *et al.* (2006)]. Hagiu [2013] suggests that, for such platforms, average costs of serving customers or of enabling additional transactions drop with the total number of participants or facilitated transactions (scale economies).

Uber, for example, leverages two-sided network effects. More drivers signing on leads to enough availability of taxis within a region, which makes it more likely for a rider to find a taxi. This results in a positive perception of the service, yielding more response from riders. Subsequently, the increasing response by riders encourages even more drivers to join the platform, allowing the company to cut fares and thus creating more demand [Parker

et al. (2016)]. The given mechanism shows that riders and drivers create complementary value for each other. Contrasting to direct network effects, in Uber's case, a driver has no incremental utility from additional drivers. But the platform becomes useful to drivers when additional riders come to Uber. This subsequently switches on a cycle of positive feedback, further strengthening the attractiveness of the platform for potential riders and drivers. A similar mechanism is followed by many other businesses, including eBay (buyers and sellers), Airbnb (homeowners and tenants), Upwork (freelancers and companies) [Hagiu and Rothman (2016)].

Interestingly, some businesses appear to integrate multiple forms of network effects within their products. Consider LinkedIn, the world's leading professional social network. The platform displays both direct and two-sided network effects. Direct network effects are due to the increasing value of the network to the existing individual users (professionals) as new users join the service. The two-sided network effects are an outcome of linking recruiters and job seekers. Recruiters are in search of new employees, and job seekers are looking for employment, which again increases the value of LinkedIn [Hoffman and Yeh (2018)].

5.5. Critical mass and positive feedback

It is important to mention, though, that network effects do not turn on automatically. To activate network effects, a product has to gain a critical mass of users. Mahler and Rogers [1999] describe the critical mass as the “*minimal number of adopters of an interactive innovation for the further rate of adoption to be self-sustaining*” [Mahler and Rogers (1999, p.721)]. In other words, the critical mass implies the adoption rate that is required to trigger positive feedback. A rate higher than critical mass generates positive feedback and thereby drives subsequent adoption of a product. An adoption rate below the required critical mass may exert a downward force, driving existing users away [Varian (2017)].

It is highlighted that users' decision about adopting a product might depend on both the existing state of adoption and their expectations about how the future adoption may evolve. The perceived value of a product increases when enough individuals have already adopted it, and potential users expect it to become popular. At this point, a virtuous cycle of positive feedback activates. On the contrary, a product will be abandoned if potential users expect it to fail and cannot justify its adoption. That effect is due to the willingness of users to prefer a technology/product that has a larger user base [Mahler and Rogers (1999); Shapiro and Varian (1999)]. For instance, you will not use a messenger service that none of your friends use. Consequently, a product with a larger user base may pull away existing users of other products, leaving those products behind. Thus, all of this suggests that consumer expectation is necessary to gain the critical mass essential to drive future adoption [Shapiro and Varian (1999)].

In their paper, Stampfl *et al.* [2013] indicate the importance of going viral (virality) with respect to reaching the critical mass required to harness network effects. For Facebook, as a network effects-based platform, reaching critical mass was particularly essential. Facebook was able to obtain the required critical mass by initially launching the service only within a geographically restricted local community of Harvard college students. As the application was meant to build upon existing personal networks of students, the adoption grew quickly, and the word of mouth was spread among peers, inviting them to join the platform. Soon, Facebook built user base within local student communities at other colleges, but initially, cross-campus connections were not made available. Later, the network effects took off when Facebook enabled cross-campus connections, since users also appeared to have existing personal contacts across other campuses [Barnett *et al.* (2008); Evans and Schmalensee (2010); Parker *et al.* (2016)]. On the contrary, it wouldn't be possible to reach critical mass, if Facebook had a few hundred or even a few thousand registrations from randomly scattered users, since they are less likely to interact with each other [Parker *et al.* (2016)].

5.6. Lock-In

Furthermore, it has been widely argued that the increasing value of a network encourages users to stick to the network, and thus contributes to user lock-in [Amit and Zott, 2001; Buxmann *et al.* (2015)]. Lock-in refers to an

attribute of a business intended to make users stay and transact repeatedly using the same product [Amit and Zott (2001)]. This phenomenon hinders users from switching to competitors' products by increasing switching costs and creating enhanced incentives. Switching costs can be understood in terms of money, as well as time [Buxmann *et al.* (2015)].

Zott and Amit [2010] illustrate the lock-in phenomenon in the context of eBay. eBay displays strong positive network effects inherent to its activity system, which reflect in massive user base on both sides (buyers and sellers). So, knowing that eBay has a large base of potential buyers motivates sellers to post their items on eBay than going anywhere else. That makes it more likely for buyers to find something they want. As a result, both parties keep coming back on eBay, and they are locked in. Microsoft's ability to generate network effects with Windows and Office-products allowed the company to achieve customer lock-in. It serves as a competitive advantage for larger companies, which is very difficult for new entrants to achieve. The same ability has contributed to Microsoft's dominant position in the software market [Buxmann *et al.* (2015)].

At this point, we should note that two concepts 'network effects' and 'virality' are often confused. Yet, there is a subtle difference. Virality is the ability of an item to get spread quickly among peers. Thus, virality helps get new users to a network, whereas network effects increase the utility of a network among users and encourage them to stay in the network [Parker *et al.* (2016)].

5.7. Reverse network effects

So far, we have been discussing positive network effects. But it is important to note that network effects can also turn reverse. The positive network effects allow to build a growing network of users, they may, however, drive users away if they turn reverse. In the extreme case, they may lead to the failure of a product. Again, the result depends on how consumers perceive your product [Parker *et al.* (2016); Stampfl *et al.* (2013); Warrillow (2015)]. A product might lose customers if they don't perceive it as valuable anymore, or a competitor's product offers something significant.

The phenomenon is described by the story of Facebook and StudiVZ. In Germany, StudiVZ was the leading social networking site for college students, which also experienced rapid growth of users before Facebook became known in Europe. Facebook did not restrict access only to college students anymore and was already established international social network. This gave rise to a positive feedback cycle in which Facebook was perceived to be more attractive by social network users. Subsequently, StudiVZ experienced a rapid user loss, as users switched to Facebook and became less attractive to new users [Stampfl *et al.* (2013)].

Even two-sided network effects can also turn reverse. Two-sided network effects require both sides of a network to grow proportionally. If one side of a network grows disproportionately relative to the other side, a downward spiral of reverse feedback may begin. In the case of Uber, attracting too many drivers relative to riders may induce conflicts among drivers, leading some drivers to leave the platform. The result will be reduced coverage density and availability of taxis, which would also lead riders to leave the service [Parker *et al.* (2016)]. In short, to maintain two-sided network effects, a service needs to satisfy demand with an adequate amount of supply.

In sum, network effects allow businesses to attain substantial and rapid growth. A large strand of literature points out that this growth component appears to be particularly significant in the information industry. Business models that were designed around network effects were able to scale massively. But at the same time, the downsides of network effects also need to be accounted for.

6. Monetization

One key element, probably the backbone, in the business model design is monetizing the value created by a product/service. Every product needs a strong source of earnings to translate technical innovation into commercial success. The value creation via a product incurs various costs. It is, thus, necessary that a company develops a suitable revenue stream to offset costs and yield profits [Teece (2010)]. The selection of a proper revenue channel,

though, is closely related to the form of value creation and value proposition offered [Wirtz *et al.* (2010)]. This section aims to discuss the four widely spread revenue patterns in the Internet age and their key characteristics.

6.1. Subscription

Basically, the subscription model has existed for centuries, but it has been redefined by technology and media companies. The fundamental idea is that instead of selling the one-time/finite offering a company rents access to the product or service over time (Most often monthly basis) [Warrillow (2015)].

In particular, content providers offer subscription-based access to their content. In their case, the value for customers is produced by offering content of various types, be it movies, music, news, videos, or any other types. The value created via the content is monetized by charging a fixed recurring fee to access it. Take Netflix, subscription serves as a major part of its business model innovation. The company innovated its revenue stream when it switched from pay-per-rental to a subscription model in 1999, offering customers ‘all-you-can-watch’ DVD rentals upon a fixed monthly fee. The same revenue model has been kept in use since the company switched to streaming in 2007. Now the company offers subscription-based unlimited access to a broad range of content, particularly movies and television series. The value proposition of unlimited access for a fixed charge, without annoying ads, is what keeps Netflix going [Rayna and Striukova (2016)]. Such an all-you-can-consume model attracts users by the breadth of options it offers. Though users cannot consume all the content, the broad range of content makes it more likely to find something they like [Warrillow (2015)].

The same sort of revenue model has been applied in the online music industry. Arditi [2017] notes that, because of subscription music offerings, “music collectors are becoming music users” [Arditi (2017, p. 8)] because they receive access to almost all the music and are not restricted only to the content they own. And as users get access to the music content (without ownership), they must keep subscribing to continue listening. The author argues here that a shift towards subscription can potentially yield a permanent increase in revenue.

Despite its wide use by content businesses, the subscription-based offering is not restricted only to content providers. A survey by Chen *et al.* [2018] reports that the subscription is being increasingly adopted in e-commerce. More specifically, it is becoming the fastest-growing new trend of shopping online. Shoppers need to subscribe to receive products regularly. More often, these services offer delivery of replenishing goods, such as groceries, pet food, or razors. Amazon Subscribe and Save and Dollar Shave Club are among the most popular e-commerce subscription services [Chen *et al.*, (2018)].

According to Warrillow [2015], the biggest challenge with the subscription model is that it requires a product/service provider to spread the revenue over the lifetime of the agreement between the provider and customer. Thus, customers are of great value over time, but in the short term, the company has less cash. On the other hand, however, the author shows the following ways that make the subscription highly valuable.

Subscription creates a recurring stream of revenue

Firstly, the benefit of a subscription resides in the stable flow of recurring revenue it generates. In effect, having recurring revenue lets a firm plan the business well in advance. Since the duration and amount of subscription are defined in the beginning, a company is able to estimate earnings. Also, this system allows predicting the demand to some extent. Knowing how many customers need to be served next month allows a company to manage supplies well and save cash.

Subscription increases the lifetime value of customers

Secondly, with a buy once system, a firm must consistently generate new demand because customers may buy once without returning. Contrastingly, a subscription offering helps build a strong long-term relationship with customers. Although, individual subscription lengths can differ, subscribers stay over a certain time duration. A

long-term relationship gives an opportunity to regularly interact with customers, understand their consumption patterns, as well as preferences, and adjust the offerings accordingly.

Subscribers buy more

Finally, subscribers are assumed to buy more, increasing long-term revenues. Again, owing to a prior customer relationship over time, subscription driven services enjoy the advantage of regularly interacting with customers. That means knowing the customer gives an opportunity to offer them additional value by selling additional features or complementary products.

Note that many subscription services are also freemium, i.e., the basic version of a service is free of charge, but you need to subscribe to have the enhanced version.

6.2. Freemium

Freemium (free + premium) is another revenue model that has gained popularity in Internet services. Freemium is inherently based on subscription but offers a different value proposition. It represents the idea of getting customers to use the free basic version of a product, and then subsequently convert them into paying subscribers by offering complementary features or an enhanced version of the product [Teece (2010)]. Therefore, to make users pay, the basic version is limited to fewer features or restricted functionalities [Wagner *et al.* (2014)].

As an instance, freemium has worked very well for Dropbox. Dropbox offers 2 GB storage on its free account. Users need to subscribe to have additional storage. Paid versions allow users to use several terabytes of space, and on top of this, users have access to a broad palette of additional features depending on the plan purchased.

Even freemium is adopted in open-source software markets. The standard/basic version of a software is available under an open-source license, and the premium version needs to be purchased under commercial license [Teece (2010)].

A key aspect of freemium products is that actual revenue is generated by paying subscribers, where they also finance non-paying users [Wagner *et al.* (2014)]. That makes converting a reasonable number of free users into paying users the critical task in a freemium business. Not having enough paying users may make it difficult to offset the costs incurred, causing a threat to the whole business [Beltagui *et al.* (2019)].

Nevertheless, building a strong base of free users is essential. It is documented that many freemium businesses operate in markets with network effects, and therefore need to gain the critical mass of users. In these markets, free users play an important role in constructing the essential critical mass [Wagner *et al.* (2014)]. As Hoffman and Yeh [2018] point out, freemium products have the potential to drive viral adoption. The authors argue that the power of free encourages potential users to try a product for no charge (after all it's free), thereby getting spread among users. The viral adoption is then likely to help build a critical mass of participants to kick in the network effects, as mentioned in [Stampfl *et al.* (2013)]. Using a free version also gives a chance to understand the value offered by a product, which may eventually get users to upgrade to a paid version. Thus, free users are necessary to build a critical mass, and the value is captured from paying users. The same reason is behind Dropbox's viral growth. The basic free version attracted new users to the service, of which a significant portion converted to paying users after they grasped the benefit of additional storage and features [Hoffman and Yeh (2018)].

To overcome the monetization problem mentioned above, many products fund the free version through third party revenues, mostly advertisements. Spotify, one of the world's largest music streaming providers, innovated its revenue model by introducing ad-supported free tier. Free tier users can listen to songs for free, but the service is interrupted due to advertisements in place. In contrast, paying users can listen to music without interruption and experience better quality of the content [Rayna and Striukova (2016)]. This way of monetization permits Spotify and others to recruit free users without hampering the revenue.

6.3. Online Advertising

The next large revenue stream is built through selling advertisements. Advertising has been in use for decades in the newspaper industry, while it has been reinvented in the Internet era. Newspapers have typically employed advertising to offset additional costs (not covered by selling newspapers) or yield additional profits [Teece (2010)]. We mentioned earlier that the emergence of the Internet and computer mediation have enabled new forms of transaction, which were not possible previously. And online advertising is one of them [Varian (2010)]. Advertising is being employed in various ways. It is often leveraged as an additional source of income to the core business. But one pattern of advertising model has fueled incomes of some of the biggest Internet firms, which allows these firms to generate income from one side of participants and make their service free for another side.

Consider search engines. Search engines work as two-sided marketplaces, whose primary source of revenue comes from advertisers, and the information is provided for free to users [Varian (2006)]. Google, as the world's most popular search engine, has built one of the most innovative revenue models using advertising. This model differs from the traditional model in notable ways. First, the model uses the pay-per-click system, which indicates that an advertiser is charged based on the number of clicks his ad receives. So, ads and positions are chosen that are likely to receive the highest possible clicks [Varian 2006; 2014]. Secondly, ads are selected using an auction system. The auction is performed considering not only bidding amount, but also ad quality scores. It is because whether an ad is appealing to consumers depends on its quality parameters and the information it contains. Finally, the ads are displayed to viewers based on the relevance of their search queries, i.e., an ad will be shown to a user if it matches with his/her search keywords, since users will get bothered if they see something not related to their interests. With this model, Google aims at connecting advertisers with their potential customers and benefit users by providing more relevant, useful ads, without inhibiting their search experience [Varian, 2006, 2014; Yoon *et al.* (2010)].

Social networks, such as Twitter, Facebook, and LinkedIn also have successfully employed advertising. The value of social networks is generated through network effects, and it is commonly monetized by integrating advertising revenues. Twitter, a microblogging site and social network, enables its users to share posts/information and interact with existing users using messages called 'Tweets'. At the same time, the company lets advertisers target a broader audience or increase engagement within their existing followers. Twitter monetizes the value created by the service through promoted content. These work as ordinary tweets, but advertisers need to purchase these in order to get displayed to the intended audience. Promoted tweets can be text-only or contain images or videos. Twitter then places these tweets relying on their relevancy to users, which is estimated by taking into account user activities, such as posted tweets, searches, views, or interactions with other users [Twitter (n.d.)]. In a similar fashion, Facebook and LinkedIn show sponsored posts within non-commercial posts as a user scroll down the page.

Like Google's model, models discussed above are designed not only to let advertisers gain higher visibility for their ads or feeds, but also guide users to find relevant information, products, or even job offerings. Thanks to powerful algorithms and predictive models that evaluate diverse customer data to make personalized suggestions [MacKenzie *et al.* (2013)]. Personalized recommendations are discussed in the last section.

6.4. Transaction fee revenue

This monetization system considers charging transaction fees or commissions. With transaction fee model, the value generated by a product is captured by charging a fixed fee or percentage of transaction price upon the completion of a transaction. The charge can apply to either one or both sides. It may also include markups on direct sales of goods or fixed or variable sales commissions. One can observe this type of revenue mechanism mainly in online-marketplaces that connect producers with consumers and facilitate interactions between them [Amit and Zott (2001); Parker *et al.* (2016)].

Companies like Airbnb and eBay might come to mind when talking about transaction fees. Airbnb's revenue model focuses on charging commissions on all transactions among guests and hosts. The profitability of this model

is driven by low margin and high volume. It means that the company targets to enable a large number of transactions between guests and hosts and charges both parties a small fraction of transaction price [Reinhold and Dolnicar (2017)]. Guests usually pay a charge varying between 5% - 15%, and hosts pay about 3% - 5% of the transaction value [Reinhold and Dolnicar (2017)]. eBay charges sellers an insertion fee and a final value fee. The insertion fee is charged for placing a listing on the website, while the final value fee is charged after an item is sold, i.e., the actual transaction between a seller and a buyer occurs. The insertion fee is not charged until a seller exceeds a certain number of listings each month. The amount of fee varies according to a product's price, category, the conduct, and performance of the seller [eBay (n.d.)].

Marketplaces involving transaction-based monetization systems are faced with two kinds of difficulties. Building trust among users and avoiding the occurrence of transactions off-platform.

Because their earnings depend on the number of transactions processed, these marketplaces must establish trust among participants, motivating them to engage in a transaction. The aim is to ensure the reliability of both parties. The marketplaces often employ ratings and review mechanisms to provide information about service providers, for example hosts on Airbnb, sellers on eBay, or freelancers on Upwork, a platform that connects freelancers and companies. However, rating/review systems are not always enough as the reviews or ratings can be manipulated or come from fake reviewers. So, e-marketplaces are implementing several ways, such as offering insurance, providing certification of assurance, or dispute resolution and payment security services [Hagiu and Rothman (2016)].

For instance, Airbnb provides insurance to their hosts against property damage, Alibaba pays a seller after a buyer has confirmed the receipt of the purchased product from the seller, to assure safe transaction. Upwork conducts various proprietary certification tests for freelancers to certify that they are qualified enough for the job given by their employers [Hagiu and Rothman (2016)].

The second challenge is to reduce the risk that participants will carry out their transactions outside the platform to avoid transaction charges, once an interaction is enabled [Parker *et al.* (2016)]. For instance, some riders and drivers on Uber may conduct a transaction outside Uber, so as some sellers and buyers on eBay after their successful first interaction using the platform.

To address that problem, marketplaces are putting penalties in place or offering incentives to transact through the platform. The former can include strict policies, such as suspending the user account or cancelling the eligibility for certain types of assurances, for an attempt to transact off-platform. While it cannot be ignored that these marketplaces experience some disintermediation (off-platform transactions), many users still want to conduct their transactions in a convenient and safer environment. That is why e-commerce platforms have introduced various incentive systems. For example, Upwork permits employers to audit and keep track of the work of freelance contractors, in addition to certifications. eBay Motors, as another example, provides buyers protection against certain kinds of fraud, such as the non-delivery of the vehicle. It also guides sellers to get lower shipping costs by leveraging its bargaining power. It thus, should be underlined that creating the safety and assurance for conducting a transaction has the potential to reduce the risk of disintermediation [Hagiu and Rothman (2016)].

7. The role of technology

While discussing business model innovation, the importance of technology can still not be ignored. For Internet businesses, it is evidenced that, among other factors discussed so far, the effective and efficient utilization of technology is essential for the scalability of business models. This can mainly pertain to the automation of processes and technical infrastructure [Stampfl *et al.* (2013)]. But particularly, two major technology trends that are affecting business models in the Internet age are “*cloud computing*” and “*recommendation systems*”. In this section, our objective is to introduce these two technology variants and their role in Internet business models.

7.1. Cloud computing

Cloud computing represents one of the most transformative technological developments in the 21st century. As itself innovation in terms of technology and pricing, the cloud is strongly influencing business models in the Internet product/service industry. Particularly, cloud technology has permitted several former Internet-based startups to become global companies. But it is noteworthy that not only cloud computing is supporting IT-based businesses, but also industries in other major sectors including manufacturing, healthcare, and finance.

Here, we refer again to Kevin Werbach, who noted that platforms, such as Facebook, Amazon, Apple, and Google are offering infrastructure for other companies [Wharton (2011)]. And the cloud belongs to one of those infrastructure developments.

Cloud computing can be interpreted as the delivery of various computing resources over the Internet on an on-demand basis [AWS (n.d.); Microsoft Azure (n.d.)]. Traditionally, companies used to operate their own data centers and servers, with a need to spend on costly computation infrastructure. In contrast, cloud computing allows new generation businesses to gain access, among other services to, storage, server capacity, computation power, and hardware, without requiring building and maintaining their own resources. Instead, the cloud provider takes care of creating and maintaining the computation infrastructure necessary [Varian (2018)]. For application developers, the cloud infrastructure creates an environment for developing and deploying applications, also making it simpler to update and improve applications [Varian (2010)]. Some of the leading cloud service providers are AWS [Amazon Web Services], Microsoft Azure, IBM Cloud, and Google Cloud Platform. To understand the importance of cloud services, we shall look into the following key advantages.

Cost-side effects:

One considerable benefit of cloud services lies in their cost-effectiveness. As noted above, cloud computing eliminates the need for small businesses to invest in expensive infrastructure, equipment, and hardware [Microsoft Azure (n.d.); AWS (n.d.)]. Importantly, an organization pays for cloud services depending on the usage and traffic, which substantially reduces operating costs. A company pays more when there are increased activities on its site, while it saves money when there is less traffic on the site [Mukherjee (2019)]. That way, the cloud business model has changed what was previously fixed costs (operating own datacenters) to variable costs (pay-per-use) [Varian (2018)].

Scalability and Flexibility:

The scalability of technical infrastructure is found to be a critical component in business model design. An organization needs to swiftly scale up its operational capability when the demand increases drastically. An example would be serving an increasing number of users or accommodating new amounts of data without diminishing the user experience. At this stage, being unable to scale the infrastructure might constrain the growth of the company and exert downward pressure [Stampfl *et al.* (2013)]. The cloud plays a vital role in solving the scalability problem as it does not require organizations to build excess capacity upfront. A company can promptly and flexibly upscale or downscale the resources to cope with changing business needs [Mukherjee (2019)]. Not only that, but a company can also scale the infrastructure when expanding the business across new geographies [AWS (n.d.)].

Speed:

The use of cloud technology makes the creation and deployment of technologies faster [Microsoft Azure (n.d.)]. It doesn't matter whether it is a web application, software, or machine learning model [Varian (2018)]. As

the cloud enables firms to access required computing resources over the Internet, it has effectively decreased the speed of experimentation and implementation. A result of this is, businesses can implement new solutions several orders of magnitude faster, without investing time in gathering and setting up required resources [Mukherjee (2019); AWS (n.d.)].

Security and Reliability:

Another advantage of cloud services is that they provide tools for securely running business operations. Specifically, cloud providers offer other businesses security controls to protect data, information, and infrastructure, thereby helping to meet compliance requirements and preserving confidentiality. Moreover, cloud makes provisions for backup and disaster recovery, protecting the data against potential loss [Mukherjee (2019); Microsoft Azure (n.d.)].

Let us now go back to Dropbox. One reason Dropbox was able to cope with the rapid growth of its user base was that the firm leveraged Amazon's cloud services. Dropbox conducted its operations through Amazon's storage service (S3) cloud platform, which skipped investments in building its own storage and server capacities. Delivering the service through Amazon S3 put the company in a position to scale without worrying about infrastructure limitations [Eisenmann *et al.* (2014)].

Netflix is another company that sensed the power of cloud computing. Shifting to streaming distribution presented a serious challenge for Netflix. After introducing streaming, customers also began consuming streamed content at a dramatic rate, instead of renting DVDs. This led to a capacity crunch as the streaming induced substantially more traffic on Netflix's data center. The result was that Netflix realized the need for accommodating higher traffic and enhancing the capacity to deliver content without interruptions. In order to fulfill this task, the company decided to migrate its operations to AWS [Cockcroft (2018)]. Since then, AWS has become the base for Netflix to operate securely, cost-effectively, and deliver users a great entertainment experience without delays and disturbance. Importantly, Netflix periodically experiences substantially higher viewing, which the company can manage with AWS since AWS supports provisioning additional compute and storage capacities in just several minutes [Netflix (n.d.)].

Similarly, Airbnb uses AWS's various cloud computing tools with distinct functionalities. Airbnb's rapid growth after its founding in 2008 made it essential to strengthen its technical infrastructure. AWS has helped Airbnb to achieve this objective by providing tools for different needs at affordable rates. Because Airbnb needs to process vast amounts of customer data and manage massive amounts of traffic daily on its website, the company utilizes different cloud-based services of AWS [Airbnb (2021)].

Note that the above examples just provide an essence of the potential of cloud computing in transforming businesses. This list can quickly get larger because many small, as well as established companies are increasingly leveraging the cloud for numerous functionalities.

7.2. Recommender systems

The second technology trend is the application of recommendation systems. A recommendation system is an algorithmic model that aims to guide consumers in the decision-making process by making suggestions for items or activities of their interest. The suggestions can pertain to selecting a product on an e-commerce website, reading an article, finding a movie to watch, etc. [Ricci *et al.* (2015)].

With the rapid rise in the number of Internet-based products and services, the variety of available options has also increased rapidly. Whether it's the number and variety of products on e-commerce websites, the amount of content on the content platforms, or the amount of information on social media, all have experienced vast increases over time. This development has accelerated growth in the amount of information that needs to be processed by users. The resulting problem is commonly known as information overload. Imagine how difficult it would be to

go through all products on an e-commerce website or movies on a streaming service to find the relevant ones. Having a vast number of options makes it difficult for users to make appropriate decisions. Businesses are incorporating recommendation systems to aid this problem. The main goal here is to narrow down the choices for users based on their interests and preferences, making customized or personalized recommendations [Schafer *et al.* (1999); Walter *et al.* (2012); Ricci *et al.* (2015)].

Customization lets you intentionally modify the experience according to your choices. For example, you can use different filters on e-commerce websites to find products that best match your specifications. Personalization, on the other hand, allows the site to display relevant products for you based on your past transactions or purchases [Salesforce.com (n.d. b)]. To personalize the customer experience, companies collect and make use of various sorts of customer data. It may include user generated reviews/ratings, search history, geolocation, past transactions, clicks, likes, shares, and so forth [Salesforce.com (no date a); Ricci *et al.* (2015)].

Depending on the applied method and data, recommendation systems are classified into different categories. A short overview of some commonly applied techniques is given below.

The content-Based technique focuses on displaying recommendations based on the purchase or consumption history of a user. Relevant items are suggested considering the items previously liked or rated by the user. The goal is to match a user's interests in the past with item characteristics [Kywe *et al.* (2012); Lee and Hosanagar (2014); Ricci *et al.* (2015)].

Collaborative-Filtering is trained to find people with similar interests and preferences. The similarity is captured through the past ratings or interactions, and the items are suggested to a user relying on items that users with similar interests liked or rated in the past [Kywe *et al.* (2012); Ricci *et al.* (2015)]. For example, Amazon's 'People who bought also bought' [Lee and Hosanagar (2014)].

Demographic-based recommender systems utilize the data on demographic characteristics of users, which include age, gender, occupation, income, location, etc., to make suggestions. The recommendations are customized according to these factors [Ricci *et al.* (2015)].

Knowledge-based method. The focus of this approach lies in gaining domain knowledge about how certain aspects of items fulfill users' needs [Ricci *et al.* (2015)].

Hybrid methods can make suggestions by combining the above approaches [Ricci *et al.* (2015)].

Popularity-based techniques recommend items by ranking the most purchased or viewed items [Lee and Hosanagar (2014)].

Impacts of RS

The use of these techniques is creating value for both the users and businesses. On the one hand, they are providing search convenience to users by better aligning the preferences of individual users with recommended items. On the other hand, recommendation systems positively affect the cost and revenue structures of service providers.

Let us start with e-commerce. One of the biggest benefits of recommendation systems for e-commerce operators applies to the cost side. The costs of stock management for e-commerce providers increase, the wider the variety of assortments they offer. Recommenders provide e-commerce operators with various user data and thus give insights into customer needs and purchase patterns. Understanding customer purchase behavior allows operators to well adjust their supplies and product offerings accordingly to what consumers want, which reduces costs associated with stocking up wrong items that are not preferred in the market [Walter *et al.* (2012)].

On the sales side, recommenders help businesses enhance cross-selling of items. It is achieved by recommending complementary or related items in addition to products in the cart or purchased items. Amazon, for example, shows related products through 'Customer who bought this also bought' or 'You may also find these products interesting'. An increase in cross-selling leads to an increase in average order size, thereby enhancing total sales [Walter *et al.* (2012)]. The analysis by MacKenzie *et al.* [2013] reports that, as of 2013, about 35 percent of purchases on Amazon were generated through recommendations.

A well-configured recommender can also improve customer conversion rate and retention. As mentioned above, consumers are experiencing information overload due to the number and range of products available. In that case, a recommender system reduces consumers' cost of discovering items (mainly time spent on searching required products). Displaying personalized products that better match a consumer's needs or interests strengthens the likelihood that the consumer would make the purchase. Moreover, the suggestions provided by the recommender system improve over time as the system leverages more data, mainly past transactions, or reviews. As a result, the system delivers better results, the more transactions a consumer performs. Consequently, a recommender serves as a channel of communication and building trust, and customers transact repeatedly on the sites that best align their preferences with offered products. [Walter *et al.* (2012); Ricci *et al.* (2015)].

Content services like YouTube and Netflix also leverage the benefits of recommendation models. On YouTube, there are billions of videos available to consumers, and it is not always comfortable to find videos on desired topics. By gaining knowledge about users' viewing habits, such as clicks, watch-time, survey responses, likes, and shares, YouTube has successfully built a recommendation system to help viewers sort relevant videos based on their interests. YouTube's VP of engineering Christos Goodrow signifies that a notable amount of overall views on YouTube is generated by recommendations, which is even more than views generated from channel subscriptions and search. This indicates an increase in user-viewer engagement due to effective recommendations. On top of that, the recommendation engine plays a key role in helping restrict inappropriate content from being widely viewed or removing videos that violate the company's guidelines [Goodrow (2021)].

Similarly, Netflix is enhancing the entertainment experience of subscribers by providing suitable recommendations for movies or TV shows. It is worth mentioning that Netflix is not new to recommenders. Earlier recommendation engines were utilized by music vendors, and Netflix became the first company to implement one for TV shows and movies. Since then, the recommendation engine became an important component of Netflix's business model innovation as it enhanced the value creation and value proposition. The company takes advantage of its recommender engine to gain a deeper understanding of consumption patterns and adjust its content accordingly. This indeed helps Netflix to plan the production of its own content based on subscriber knowledge and desires [Rayna and Striukova (2016)]. According to MacKenzie *et al.* [2013], as of 2013, about 75% of watches on Netflix were due to these recommendations.

In essence, with personalization, content providers can enhance the user engagement [Salesforce.com (n.d.)] and perceived value of the content offered [Wirtz *et al.* (2010)].

Search engines and social networks comprise another popular domain for the use of recommendations. As in other domains, users of social networks are also overwhelmed with available information. Thus, social networking sites are employing recommendation systems in diverse ways to support users in recognizing relevant information (news, feeds, posts, etc.), and performing activities that are pertaining to their interests. For that reason, social networking platforms use data based on existing connections of users or user activities, such as likes, posts, comments, tags. Two major kinds of social media recommendations are people recommendations and content recommendations [Ricci *et al.* (2015)]. Twitter, as an example, sends notifications suggesting which people to follow. Likewise, LinkedIn suggests new possible connections. Content recommendations may include tweets on Twitter, recommended posts on Facebook or LinkedIn.

In the case of search engines, search engine advertising inherently incorporates customized recommendations as ads are placed depending on a user's query. Search engines also permit users to specify areas of their interests and then display ads that relate to those interests [Varian (2010)]. In parallel, displaying relevant sponsored content is probably the most important function of recommendation algorithms for social networks.

In summary, recommendation systems improve both the consumer experience and the business models of companies. As we discussed, personalized and customized suggestions, whether for video streaming, music, merchandise, or other services, are critical in enhancing consumer satisfaction and lowering search costs.

8. Discussion

In this article we focus on discussing the elements that have a vital role in Internet-based business models. Based on the discussion so far, it is apparent that businesses which implement Business Model Innovation outperform businesses who focus merely on Product/Technology innovation. In line with this, a study by the BCG shows, BM innovators outcompete product or process innovators over time [Lindgardt *et al.* (2009)].

Through the survey of existing literature, we found the following factors essential for Internet products and services:

- Value proposition and target market
- Product-market fit
- Distribution
- Network effects
- Monetization and
- Technologies (Cloud computing and recommendation systems]

Furthermore, we attempt to provide ample industry best practices examples using the above-mentioned components to drive business model innovation understanding to the reader. But note, that the list of the examples included is far from complete, and we encourage the reader, to explore each of those aspects in further detail, and how they apply in the context of other various Internet-based businesses which are not mentioned in this study.

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