COVID-19 and Software Development

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Abstract
The COVID-19 pandemic that occurred in 2020 had an impact on nearly every organization, including the technology-oriented ones. The effects have ranged from minimal hazards to serious interruptions, but also thriving enterprises, depending on the various industry areas of the companies. During this period, the ability to move quickly and to be resilient have been necessary for survival. To fight the pandemic, software developers worldwide had come up with several technological developments and advancements. This paper will focus on the changes COVID-19 brought to software development, the processes that software firms followed during the pandemic, and any recommendations needed to help software development during pandemics.

Keywords:
COVID 19, Software, Pandemics, Productivity, Software Development.

1. Introduction

The coronavirus pandemic spread worldwide, prompting the World Health Organization to proclaim it a global health emergency. To stop the virus from spreading, governments implemented laws and made suggestions. Many companies experienced an abrupt disruption. Technology firms worldwide had no choice but to close their offices and have their staff work remotely. Software development, for instance, is one of the tech jobs that were positively and negatively impacted during the pandemic [1]. Although Covid-19 influenced every business, the software market displayed remarkable resilience and, in some cases, even growth. From the many studies and surveys that have been done, the field has been found to have taken a positive trajectory since the pandemic [4]. While some employers said quarantine could not be compared to regular work, many were willing to try it.

2. Software Development

Software development refers to a collection of computer science tasks focused on the process of developing, building, and delivering software. Some of the standard functions in the field include software testing and debugging, database development, application development, and software system development . Software development has grown from its small start in the 1960s to become one of the world's most significant sectors. It is anticipated to contribute a lot to the world's gross income each year, and since 2016, its market income has continued to increase annually.

It's nearly impossible to imagine modern living without computers and technology, given how big of an impact they have had over the last 40 years on our lives. The Government and businesses are advised to embrace software development as an on-demand profession if they want to stay current. A new possibility where software developers would greatly profit when their products are reproduced for usage in different markets arises when various software tools demonstrate their resilience in meeting client needs.

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2.1 Pre COVID-19

Before the COVID-19 pandemic, software development was still in the market, alive and thriving. It was and still is an essential component of people's personal and professional lives, from the online browsers we all use to access social media to the office productivity programs used by businesses worldwide. Several firms had already incorporated software to help them run their daily activities. Software development was recognized by those who knew how much difference it would make [4]. However, the people who had this knowledge were only a tiny percentage. The rest did not seem to take any interest in the matter. Public facilities like schools and hospitals had made physical interactions the only way to access their services, except for the few institutions that embraced software technology [4].

2.2 Post COVIDE-19

Due to the COVID-19 outbreak, businesses shut down their businesses and instructed the staff to work from home in an unusual natural experiment [16]. Many managers feared their engineers would not manage to work efficiently from home or would not have any motivation to do so, that they would lose control and not even notice when things do not work the way they are supposed to. However, others agreed that the change in a work environment will result in substantial changes in the post-pandemic workplace and is an opening to take home the vital lessons learned concerning productivity. The pandemic has caused a turn-around in consumer behavior. Online grocery orders and restaurant takeaways have now become a common thing. Retail and wholesale shops have provided a way to order and pick goods online without contact or physical interaction. Students can now take classes from wherever

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they wish. These changes are potent reminders that conducting business online is now necessary, not optional and this has been made possible by software technology [5].

3. Positive impacts

The software business, in contrast to the majority of other industries, has fared relatively well during the COVID-19 storm. Tech companies seemed to be escaping the crisis relatively undamaged, compared to sectors that depend on physical interaction with clients, such as hospitality, tourism, etc. which were ruined by stay-at-home restrictions and company closures. The pandemic events have caused several aspects of the software development industry to perform better than they did previously. The pandemic increased daily screen time by 30% and accelerated the adoption of digital technology by several years. Some of how the field has been impacted positively include:

3.1 Increased productivity

By preventing programmers from spending too much time in meetings, working remotely seemed to fit with the habit of software development being usually a single endeavor. The profusion of video conferencing and social platforms, like Slack and Skype [15], made it possible for the workforce to stay in touch without consuming much time engaging in physical chit-chats. Software developers could also customize their schedules thanks to the flexible working structure of remote work. As a result, many developers have indicated that they can produce more results in a ten-hour day than they could in a more extended office stay [1].

3.2 Increased demand for development services

The demand for software developers has increased despite a drop in the need for some key service providers in 2020. The Randstad research report states that in the early weeks of the epidemic, roles in software development increased by 1% and 8% after the pandemic. More specifically, since the lockdown limits, software engineering and development jobs have increased by 5% since the introduction. The most considerable increase happened before the coronavirus news became public. According to the data, compared to December of the previous year, the demand for IT employment surged by up to 90% in January 2020. Developers' work has become more valuable hence raising their demand even higher. This is because low or no code development tools are in excellent order in addition to the rising need for software services [8]. With the help of these development tools, companies may easily design and implement their services.

3.3 Improved digital health care solutions

The rise in the use of digital technologies in the health sector was the most unexpected impact of the pandemic. Hospitals worked effectively with software development outsourcing companies to develop Artificial Intelligence applications. As a result, the developed applications enabled healthcare professionals to provide services to patients without contact. To control the spread of the virus, a good number of nations also created their Covid19 trackers [9]. The apps warned users when they have been among people infected with the virus, allowing them to isolate themselves and get medical attention.

3.4 Evolution of consumer demands

COVID-19 also altered customer behavior because they had to shift from the physical way of making purchases to browsing and buying online. Companies have tried to adapt and implement strategies that consider the present situations. Businesses that want to market and sell their products have developed sophisticated internet stores or mobile applications that let customers make purchases without physical interactions. Also, it was discovered that a shockingly small number of companies had the appropriate technologies to handle the difficult circumstances of the pandemic. The ability to create online business platforms, logistical applications for suppliers, and solutions for vendors made 2020 a busy year for software developers [10]. Supply chains were equally impacted, especially in the early stages of the pandemic. As a result, compelling digital services and apps were essential for enhancing transparency and smoothening communication between buyers and suppliers [18].

3.5 Increased digital spending

Despite the decrease in the overall spending in companies, some of them managed to maintain and increase their digital spending due to the pandemic. According to a recent Institute of Financial Studies (IFS) report, 60% of businesses increased or maintained their investments in digital technologies before COVID-19. However, just a quartile of the companies reduced their tech spending following the effects of the virus on the software segment. The main reason for the increase in digital spending was the fear people had, which was caused by the economic volatility that had been happening. The survey also showed that 52% of businesses raised their digital spending due to COVID-19's macroeconomic disturbances [12]. The embrace of digitalization by companies was, however, not a surprise since every company wanted to work remotely and at the same time meet their clients' needs.

4. Negative impacts

Despite the many positive affects the pandemic had on software development, it had some adverse effects on the field and every other aspect of life. The overall and main negative result was the death of many people. In the software development field, the virus interfered with the normal functioning of the events [14]. Some of the adverse effects on the area are:

a) Limited collaborations: For many businesses, including software development, the shift to remote employment hampered collaboration and little communication [18]. At this point, companies focused on how they would save themselves from going down the drain [11]. The visits paid by investors to the company were drastically reduced to almost none.

b) Reduced productivity due to distractions at home: Almost 30% of developers complained that their output had been reduced due to the lockdown [1]. Home is known to be a place of comfort, but it could also have a lot of distractions. Developers are mostly known to work in areas without distractions since they require maximum concentration [7]. Most of the time, this could not be attained at home due to distractions from electronic gadgets, family members, especially children, temptations to sleep or even engage in other activities, noise, etc. With all this going on at home, sitting down and working for three to four hours was not easy.

c) Inability to practice teamwork: Developing programs and software requires one to engage in collaboration and consultation with fellow developers. This was, however, difficult to do during and after the pandemic, given the minimal physical interactions and work-from-home policies [11]. Also, after the pandemic, it became difficult for things to return to normal since most developers had been used to working alone.

5. Technologies and processes that software firms followed during the pandemic

During the COVID-19 pandemic, software firms had to develop technological solutions, processes, and solutions that had to be followed to keep society functional. The technologies have been beneficial in reducing the virus's spread and keeping businesses up and running. These solutions have had a long-lasting impact beyond the pandemic. Some of the technologies that have helped to build a strong community include:

5.1 Teleworking

During the pandemic, companies introduced telework, allowing staff to work from home. Remote working involves using technologies such as cloud, facial recognition, virtual private networks, work collaboration tools, virtual meetings, work collaboration tools, and even voice-over IPs [15]. Remote employment was said to reduce the transmission of infections and the time the working staff took to commute and offer greater flexibility [3]. However, teleworking has been found to have some challenges for both employers and staff [7].

5.2 E-shopping and robot deliveries

COVID-19 has changed online purchasing applications from a plus to a need. Most delivery industries and cafes in the world introduced no-touch delivery services to avoid having to transport items or pick them up from a person. The development of delivery of goods through the use of robots also accelerated among the biggest e-commerce companies in the world [8]. To guarantee that the goods being delivered are safe and virus-free, delivery organizations are advised to devise defined rules before the robot delivery system becomes a worldwide thing. All this is because human delivery of goods is not virus-proof.

5.3 E-learning

1.6 billion students were affected after over 200 schools were closed due to the pandemic. Consequently, learning activities were disrupted for some time before the schools began offering online courses [10]. Some technologies used to carry out this exercise were AI-enabled robot tutors, virtual reality, 3D printing, etc. However, distance learning put some pressure on the parents since they need to purchase learning gadgets for their children and stay home to watch them.

5.4 Digital payment

Central banks worldwide were forced to ensure that their bank notes are cleaned before circulating to ensure they are virus free. However, this was not the best idea because the cash could pass through an infected person's hands, causing the virus to spread. To prevent this, digital purchases and payments using either credit cards or e-wallets were highly advised. This made it possible for people to quickly transfer funds and make payments for commodities, services, and utility bills.

5.5 Telehealth

Software developers came up with wearable IoT devices that can detect the disease's signs and symptoms. Also, some programs like Chatbots were designed to make early diagnoses depending on the symptoms given by the patients [6]. These devices and software provided an effective way to deliver primary health care and still reduce the spread of the virus [2].

5.6 Online entertainment

COVID-19 might have reduced physical interactions but not online because all sorts of entertainment could be accessed in the comfort of one’s home. The popularity of online concert streaming and cloud parties increased

globally. Film production companies also made online film releases. Virtual tours were made available at international heritage sites and museums. Since the pandemic, there has also been a significant increase in online gaming.

5.7Supply Chain management

The COVID-19 outbreak has hampered the worldwide supply chain [17]. Some factories are shut down entirely due to distance restrictions and quarantine directives. Some nations have enacted varying degrees of export restrictions on food and personal protective equipment despite the rising demand for those products. The current supply chain system is vulnerable to pandemics due to its heavy reliance on documented records, lack of data prominence, diversity, and adaptability. Core technologies like blockchain, Big Data, IoT, and cloud computing have created a more reliable supply chain management system by improving data accuracy and promoting data exchange [12].

6. Hybrid working

As we get used to the post-COVID world, software development firms are advised to start embracing hybrid working models because it is clear that technology is here to stay. Hybrid working is a flexible model where the working staff is partially distributed at work and home [19]. With 2020 significantly changing everything, including how people work, many companies will adopt remote work significantly. Given the several challenges that are faced during remote work, it is only wise to have the hybrid models implemented. The hybrid working model is popular in tech companies. This is primarily because most of the work done by software developers can be carried out remotely, provided all needed tools are available. When working on personal projects, the hybrid approach allows software workers to work from home, but it also gives teams the chance to work together, come up with ideas, and socialize in bigger groups [20]. This equilibrium is essential for increasing employee mental health and welfare, and worker productivity. Therefore, it should be no surprise that the practice would be adopted so broadly within the software and other tech companies, given that a good balance of office and home-based labor provides organizations with a way of success.

7. Conclusion and future work

Software development has played a significant role in helping the world cope during and even after the pandemic. Everyone has witnessed the digital transformation, and most have embraced it. The pandemic has demonstrated the value of software developers in the world today [11]. It has also proved the importance of digital readiness such that any pandemic will not be able to get in the way of any business or daily functions in the community. Any company or nation that wants to stay competitive in the post-COVID-19 world must develop the infrastructure required to support a digitalized world and stay abreast of the most recent technological advancements. According to the BBC report, approximately 200 million people lost their jobs during the pandemic, and this has caused vulnerable people in society to undergo many hardships. Job positions available to people are changing thanks to software development and the COVID-19 pandemic [13]. Lastly, software developers should work on conducting follow-up studies to determine whether the impact the pandemic has had on software development will change or remain constant over the coming years.

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