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Spying on Students: Education in the Digital Age

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Before 2020, privacy concerns for students were mostly limited to what could be monitored on paper. But with the mass migration towards digital services in order to contain the spread of COVID-19, concerns are building around the security of our newly constructed digital infrastructure for the educational sector. Nowadays, most post-secondary institutions use a learning management system (LMS), such as Canvas, Blackboard or Google Classroom. Beyond this, students are often required by their university to install proctoring software like the Respondus LockDown browser that, in a dystopian twist, typically have complete access to a user's computer, from full disk access to camera recording. Now, educators are struggling with finding a balance between total surveillance and maintaining educational integrity while also simultaneously constructing this digital infrastructure from the ground up.

The rapid adoption of eLearning systems is facilitated by three things: general global trends towards digitalization, switching to cloud-based web systems, and (perhaps most importantly) the onset of the Coronavirus pandemic. Before the pandemic, the eLearning market was valued at \$150 billion, but in 2020 it grew beyond \$250 billion, far surpassing previous growth predictions [1]. But such rapid growth poses a question: have these systems had ample time to develop the proper cybersecurity to fully integrate with our digital world?



01. Spying on Students: Education in the Digital Age

Although it's not the usual target for hackers, the educational sector seems to be far behind in terms of cybersecurity. For instance, ProctorU and Proctortrack both had data leaks in 2020, exposing students' full names, addresses, passwords and other sensitive information [2][3]. A Consumer Reports investigation into the latter found that Proctortrack had made some critical mistakes in their cybersecurity practices, including hard-coding passwords [3]. Many experts considered this to be a rookie mistake and were concerned about the status and efficacy of cybersecurity in other eLearning systems.

Then there are the ethical concerns. In order to detect cheating, proctoring services employ anything from artificial intelligence techniques such as continuous facial recognition to using real people to monitor students during tests [3]. However, some argue that this is a violation of student's civil rights as such algorithms can be discriminatory: Shea Swauger of the MIT Technology Review wrote of her black friend's testimonial using proctoring software wherein "it always prompted her to shine more light on her face. The software couldn't validate her identity and she was denied access to tests so often that she had to go to her professor to make other arrangements. Her white peers never had this problem [4]." Yet, students often have no other choice than to grin and bear the constant surveillance and machine learning perpetuated discrimination.

Indeed, discrimination is not a new issue for artificial intelligence— from experiments in crime prediction to even more specific instances like Amazon's defunct recruiting tool which turned out to be sexist— nor is it a new issue for education [5]. Recently though these two issues have come to a head during the Coronavirus pandemic which has combined the two previously disparate fields. Some discuss the future of education becoming fully online for the foreseeable future, but issues such as these really call into question: are we ready for that development?

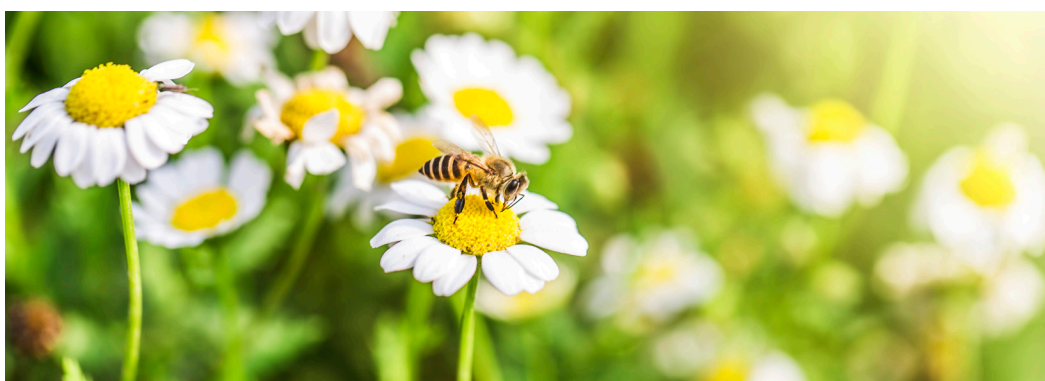
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Bees vs Bills: Does 5G Actually Affect the Ecosystem?

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Technology has changed a wide variety of disciplines including biotechnology, the physical sciences, and medicine. Yet it is hard to deny that while humans benefit from the development of technology in several ways, the effects on the animal kingdom have been great. With the fifth generation (5G) of cellular communication being rolled out in almost every part of the world, a large number of scientists and researchers raised their concerns about the health and environmental harms that 5G can potentially cause. Several environmental organizations have written appeals on the issue of wireless radiation exposure, claiming the unrestricted consumption of energy can have a negative impact on trees, animals and wildlife in general.

A letter from the Environmental Working Group To California State Officials states “there is already adequate existing sound science for government to proceed with caution on the roll-out of the new technology. In particular, the results of the \$25 million National Toxicology Program study (2016) that showed tumors in rats caused by a typical amount of heavy cell phone use are to be reckoned with.” On a similar note, in France, not only Greenpeace released a position on 5G as a global source of “digital pollution” that will cause carbon emissions and e-waste, but last year, the “Extinction Rebellion Orléans” collective also mounted protests such as posting anti-5G posters and organizing a demonstration [1].

The overarching issues remain unresolved. Dr. Albert Manville, adjunct professor at Johns Hopkins University and retired biologist with the U.S Fish and Wildlife Service, pointed out in his recent interview that industry profits should not override environmental concerns. He noted “Now we have 5G rolling out in massive quantities, without due diligence to determine are these sources of radiation safe not only for humans but for wildlife. And the answer is, no, they are not [2].”

In India, Bharti Airtel has conducted the country’s first open radio access network (Open RAN)-based 5G network validation on 3500 MHz band test spectrum allocated by the department of telecom (DoT), together with Mavenir, a telecom network software provider [3]. While the radiation is harmful to all flora

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and fauna, scientists state that the consequences of further 5G network development might be irreversible, particularly for honeybees that are already considered endangered.

According to the report, the honeybee population has decreased by 89% over the last century and continues to decline due to several factors, such as habitat loss, pesticide usage, climate change, and disease. Moreover, within the past 20 years, bees completely disappeared from eight states and have become very rare in many others [4]. It has been shown that not only the factors listed above but also alternating electromagnetic fields, including ultra-high-frequency (microwave) radiation of a new generation of 5G networks, can have a harmful effect on them [5].

So while bees are under assault [6], what can people do to help? Green technology is expected to be beneficial. Energy consumption will be cheaper, and as it is an emerging field, will take a great deal of innovation and creativity to create better products that don't contribute to pollution [7]. Bee biologists also say that planting various varieties of flowers around farm fields can also help to keep bees healthy [8].

However, there's still a long way to go to achieve a status quo where both humans and animals would be on an equal basis of right to protection. Dr. Alan M. Eddison states "In the vision of constructing skyscrapers, launching rockets, and extracting gasoline, people fail to protect nature. Thus, it is fair to say, that modern technology owes ecology an apology [7]."

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AI in the Film Industry

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In the context of the pandemic and global instability, the film industry continued with its tradition by holding the 94th Academy Awards earlier this week. At the event, it widely discussed how artificial intelligence was used to predict the potential winners and nominees. For example, a company called Unanimous AI has been predicting Oscar winners for the past decade with an average of 90% accuracy [1]. AI is now expanding on this role to become gradually involved in the process of film production directly.

Building on this technology, an AI robot named Erica is said to be the leading actress in a film for the first time, with the intention of her appearing as a real actress [2]. Although scientists have no doubt in the capability of Erica, many audiences have questioned her acting skills since she has no life experiences or

emotions that would contribute to an actor's repertoire. On the other hand, some audiences have begun to anthropomorphize and feel emotionally connected with those robot characters when they took on small roles. Regardless, it seems that AI and robots will be more frequently featured in media and increase their presence by gradually replacing actors.

Artificial intelligent can also aid the pre-production process. For example, as AI can interpret scripts, it can provide recommendations for real-world shooting locations and inform directors during the scouting process [3]. The algorithm also has the ability to analyze past performances and the fan base of auditioning actors and provide recommendations for casting. It may also participate in the script-drafting process and utilize past data to identify potential problems or false representation of facts and historical events in the story. On the whole, AI has already penetrated into the whole film-making process, from pre-production to the actual playing of the role as well as post-editing and promotion.

Despite the various benefits and conveniences AI has brought to the film industry, some critics, however, have claimed that the application of AI may be problematic for filmmakers [4]. Because AI algorithms are mostly developed based on past data, creativity may be a new challenge especially in the film industry where it is key. Moreover, as film directors nowadays are extremely cautious of including gender and diversity biases on the screen, AI may fail to convert those biases as it studies the conventional productions which largely consist of scenes or ideas that may be considered inappropriate by the audience. Thus, although AI has undoubtedly scaled up the film industry, there are some aspects that should be further considered in the future.

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Should Social Networks Self-Regulate?

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In recent years, social media has come to play a key role in political communication and the shaping of public opinion. It introduced two new features to the communication scene in particular: the decentralization of traditional media as prompters of public opinion, and the possibility of more engaged citizen participation through digital means [1].

In particular, Twitter has been one of the most important social networks used to establish direct communication between politicians and their supporters, providing means for massive campaign broadcasts [2]. Nonetheless, this has also given rise to some controversial situations and debate about the influence that users and public figures have in social media, and the faculty that digital platforms hold themselves.

One of the most emblematic cases of this development is the official Twitter account of former US President Donald Trump. His account was suspended soon after some publications, which, according to the platform, violated their policies and use regulations as they were classified as “violent-inciting” [3]. This started a debate among social network users and the public. Opinions on the matter were divided, and while some believed that the action was censorship that violated freedom of speech, others defended the decision of

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Twitter as an act of social responsibility to prevent further violence or radical ideologies [3]. Major political figures who spoke on the matter expressed their concerns; former German Chancellor Angela Merkel said through her spokesman that “The right to freedom of opinion is of fundamental importance” and that Twitter had the right to add warnings to Trump’s posts, but their permanent suspension was a matter of concern for free speech [4].

The measures taken by Twitter and other social networks has highlighted the impact that self-regulation in this type of companies can have over political and social life. Questions regarding when it is right for platforms to censor users arise, especially when it comes to public figures.

According to coordinator of Law Research and Artificial Intelligence at the Autonomous University of Mexico, Pablo Pruneda Gross, social media companies are private entities, but since they have a public scope, they should be subject to established regulations that set an equal ground for all users. Moreover, Gross adds that the controversy should not be limited to whether platforms ban users for policy infringement or not, it also involves if companies by themselves should have the right to such sanctions, or if public justice entities should be the ones to decide the penalties for such violations [5].

The debate over social networks regulations is not a simple one. As digital movements grow, the political landscapes across the world are also being shaped, and the flow of information increases with the benefits and risks that it carries. If social networks should be left to self-regulate or be state regulated to some degree, it is still an issue that requires a deeper understanding of digital phenomena and social behavior.

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The EU Plans Again to Disturb the Internet Market

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It has been nearly 4 years since the EU implemented its General Data Protection Regulation (GDPR) [1], a policy that has had a far-reaching effect. Although the EU members were the only countries to implement a new data protection policy, it affected Internet companies around the world. This time, the EU wants to crack down on large Internet companies for acting as “gatekeepers” in the digital sector. In March 2022, the members of the European Parliament agreed on various new rules introduced in the so-called “Digital Markets Act [2]” that would strengthen the regulation of the largest firms in the digital sector.

What motivates this act? According to the current draft, there exist large digital platforms that serve as the gateway to the digital market for both customers and other businesses. In turn, the firms operating those platforms have the potential to abuse their position and act as rule-makers. An example of such a platform that is constantly used in the media is Apple’s App Store. The App Store is the only platform that Apple users may use to purchase software for their devices, hence it acts as a gatekeeper for app developers who need to play by the App Store rules. Other firms operating such platforms include Google, Facebook, and Amazon, firms that have undoubtedly dominated their respective digital markets.

At first, this act may seem like an ordinary antitrust measure to create a more competitive environment in the digital sector. However, once reading the draft version, there are various points that raise concerns. The

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act lists “do’s” and “don’ts” that gatekeepers are supposed to follow and one of the “do’s” is that they need to allow third parties to inter-operate with the firm’s digital platform. In practice, for instance, if a Facebook customer wants to switch to a competing social network, Facebook would be required to send a copy of all the customer’s data to the competitor. This would be quite an unusual measure considering a sector in which firms earn most of their revenue from owning such customer data [3].

Critics of this act point out that the Digital Markets Act is a political move and reflects the EU’s protectionism and attempts to spur the creation of domestic rivals. According to the draft, only firms with over €6.5 billion in revenue in the last three years or €65 billion capitalization would be classified as gatekeepers, but the only firms that currently fall in this category are a handful of mostly U.S. companies. Authors of recent articles in the Financial Times and by the Brookings Institution mention how European leaders openly support the idea of protectionism in the digital markets [4] [5]. Similarly, in an article from last year, The Economist details the downfall of European multinational corporations who are losing market share to their competitors from the U.S. and China [6].

The bureaucrats in Brussels seem united in their opinion that the digital market is somehow different than any other market and want stricter rules for its participants. One thing they should remember though is that stringent regulation won’t create a playing field in which new European companies can emerge – in fact the opposite is expected.

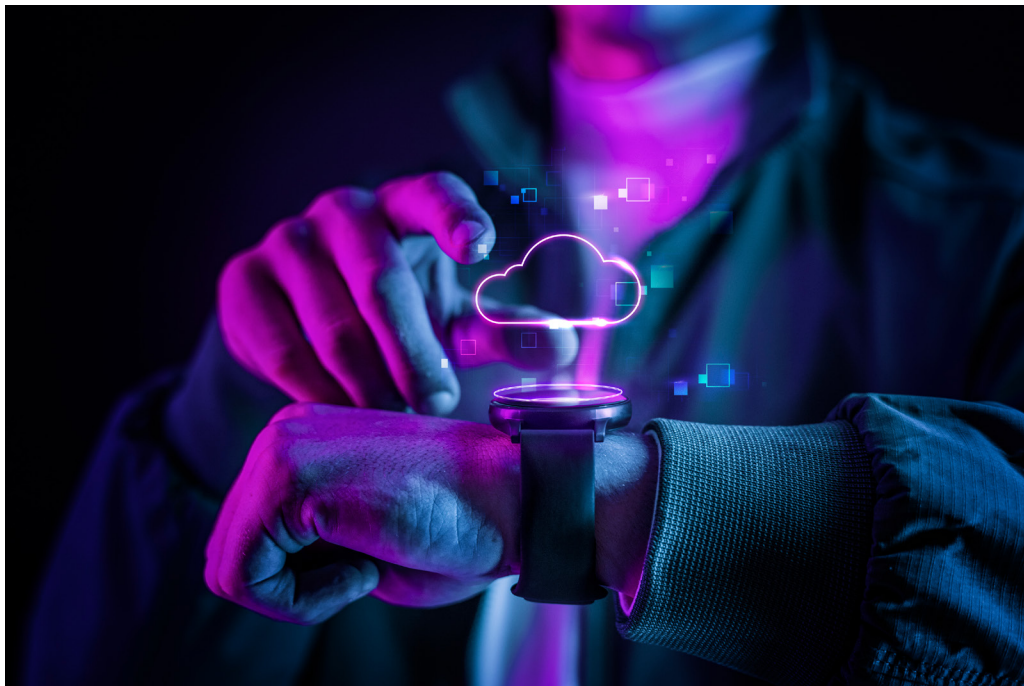
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Data Collection in Wearable Wellness Devices

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Data collection has always provided companies with the ability to make decisions and create better experiences for customers based on available information [1]. In addition, consumer-driven data helps customize content on websites as well as in stores, allowing companies to increase sales and grow their profitability margins. By collecting this data, companies can gain a competitive advantage over their competitors if used conscientiously. The potential of predictive analysis to drive sales is enticing for any conglomerate but the problem comes in the risk of jeopardizing the customers' trust should their information be exposed through hacking [1]. The reliance on consumer information as well as the usage of third parties have created a grey area in which companies need to now be upfront with not only what information is being taken but also the storage and usage of it in the future.

Since the emergence of Internet commerce and big data, the shift in concern from mere product information to now consumer information has hit the headlines with many wondering about the balance of data privacy and commercial values. An example of this can be found in “the new generation of mobile

06. Data Collection in Wearable Wellness Devices

applications, biosensor-equipped clothing, and wearable fitness devices” which aim to help users take control of their health with promises of weight-loss and reduced stress [2]. Beyond these applications, these wearables are just the surface of user-driven devices on the Internet of Things [2]. From thermostats to refrigerators to cars, these so-called “smart” devices have seen a growth in demand and a new market, helping not only address public health concerns but also support underserved communities and those with chronic health conditions [2].

It is these patient and consumer-driven devices that have been able to be empowered by technology, allowing not only the individual to track their lifestyle but nonprofit and research institutions as well in hopes of developing large-scale medical knowledge [2]. However, it is also these very features that make life so accessible that it is at the same time raising serious data security concerns [2]. These trackers, smartwatches, and connected monitoring systems are collecting everything from an individual’s heart rate to their brain activity, mood, and emotion [2]. This information, though seemingly harmless at first, is only part of the bigger picture in the increasingly more technologically connected world where frustrations and growing mistrust and cynicism have now grown amongst the public concerning the pervasiveness of data collection and storage of their digital lives [2]. The concerns of the public have been voiced as seen in the US National Telecommunications and Information Administration with individuals stating that “Americans are increasingly concerned about online security and privacy at a time when data breaches, cybersecurity incidents, and controversies over the privacy of online services have become more prominent [3].”

As the world gets more and more involved with wearables and the Internet of Things, the usage of data and personal information tracking needs to be forefront with not only the usage of the devices but the regulation of the stored information. With the smartwatch almost surpassing analog these days, the consumer must still keep in mind the inner workings behind where their health information is going.

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How Algorithms Distort Reality

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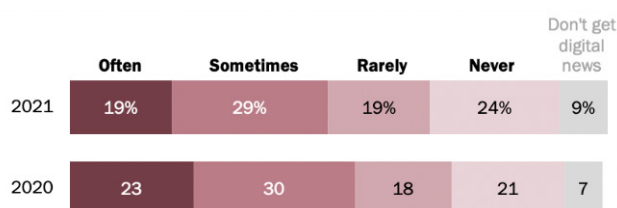
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Social media algorithms carefully curate the perfect feed to keep a user engaged. In the online world, attention is currency. Users will only be presented with content that will keep them engaged for the longest period of time. As a response, media overall becomes less populist and more curated. Eventually, individual perception of reality can shift as the information provided on one person's feed will vary drastically from what another user is seeing [1].

This phenomenon was demonstrated in 2020 during the pandemic in the United States. Systemic issues rose to the surface and gained coverage such as the Black Lives Matter movement, tensions regarding the upcoming presidential election, and xenophobia spurred on by the COVID-19 outbreak. While perspective and journalism are always major players in news consumption, in this case so were algorithms. Issues with political radicalization become extremely prevalent when people consume false information, which many have admitted to doing; “a little under half (48%) of U.S. adults say they get news from social media “often” or “sometimes,” a 5 percentage point decline compared with 2020, according to a 2021 Pew Research Center survey [3].” While the number of users who get their news from social media since 2020 has decreased, approximately half of the population uses social media as a news source. The diagrams below demonstrate data gathered by the Pew Research Center about news consumption on social media, the highest percentage of which comes from Facebook, which is notorious for fake news.

About half of Americans get news on social media at least sometimes, down slightly from 2020

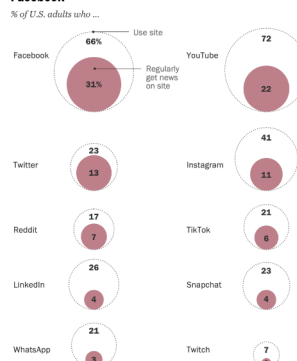
% of U.S. adults who get news from social media ...



Source: Survey of U.S. adults conducted July 26-Aug. 8, 2021.
“News Consumption Across Social Media in 2021”

PEW RESEARCH CENTER

Nearly a third of Americans regularly get news on Facebook



Source: Survey of U.S. adults conducted July 26-Aug. 8, 2021.
“News Consumption Across Social Media in 2021”

PEW RESEARCH CENTER

According to Jensen, during the 2016 presidential election, Russian fake news media promoted to Americans incorrect articles to consume and radicalize the masses - primarily planted on Facebook. Another popular source of news, primarily for younger generations, is Twitter [6]. Creating news literacy to navigate Twitter becomes increasingly important as the site continues to be a hub for micro news [7]. Due to the website's ability spread information at the speed of light with the combined convenience of writing a

microblog within a matter of minutes, it is an accessible source of fake news.

In a new digital age, it is not unusual to see personalized news feeds with varying credibility, as opposed to a few news outlets with one column. Indicating that the news people consume can become more out of touch with reality and closer to what an individual wants to believe or see. Technology continues to integrate itself into society, and with the construction of an up-and-coming metaverse, online ethics become increasingly important. An algorithm becomes something that “is a math [that is] written but can no longer [be] read. It’s a math that is no longer derived from nature, but rather one that rewrites nature [10].” Individuals should be aware of the impact that algorithms can have on their offline lives and the consequences of consuming fake news. Digital literacy needs to be taught to all in order to maintain an educated user base and a healthy in-person society.

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Public Funding for ICT Infrastructure: Lessons from Brazil's Pix

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Central banks play a critical role in ensuring payment system's safety and integrity. They operate as protectors of money and payment consistency in a country. Payment services are being fundamentally reshaped by digital innovation, and this innovation is being embraced by central banks around the world. By enabling competition and interoperability amongst payment platforms, public payment infrastructures expand the central bank's basic role in the monetary system. They have the potential to lower consumer expenses while also promoting financial inclusion [1]. Brazil's recent experience with Pix, the novel retail quick payment system exemplifies the possible benefits that can be achieved.

In 2018, the Brazilian Central Bank announced the launch of an instant payment scheme developed, managed, operated, and owned by the central bank, and in November 2020, Pix was launched. Among the goals for the development of such service are improving efficiency and competition, promoting digitalization of the payment market, promoting financial inclusion, and filling gaps in payment instruments currently available. After its launch Pix has grown rapidly: 114 million people (67% percent of Brazilian adults) have made or received a Pix transaction. Furthermore, 9.1 million businesses venues have joined Pix, accounting for 60 percent of all businesses in the country [2]. Among young people (aged 18 to 24), approval of Pix has reached 99%. The reason for Pix to be so popular is because it has promoted financial inclusion in Brazil - as a digital, agile, and secure service that allows transactions in a straightforward way [3].

Every citizen in Brazil can create a user key, that can be an email address or national ID, or even any chosen word. Anyone can go to a store and make payment using their bank app just referencing the user key of the person or company they want to send money to. The system is so simple that it can be used for non-conventional business venues, such as street food establishments or micro retailers. Also, with the growth of independent e-commerce, where everyone can sell something using social media, Pix made a difference while allowing transactions to be more convenient. Pix is a great example of how to use digital resources and communication to improve complex systems.

Future innovations will be implemented into Pix in order to broaden access to functions and provide even more competitiveness to the system. One of the features that are being developed is called 'Pix Aproximação' that will allow transactions carried out using short-range wireless communication technology. Also, methods to make Pix transactions by people who do not have internet access are being studied [4].

08. Public Funding for ICT Infrastructure: Lessons from Brazil's Pix



Figure 1: PIX on everyone's phone. Source: olhardigital.com.br

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Changes in the North Korean Electronic Financial System under Kim Jong-un

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Since Kim Jong-un came to power, North Korea has introduced several market economy features. The Central Banking Act and the Commercial Banking Act were amended in 2015, which lead to changes in the banking system, money circulation, and payment methods by encouraging the usage of electronic payment cards and allowing companies to open “cash money seats”

First, the North Korean banking system has changed practically. It is now categorized into central banks, commercial banks, and financial corporations [1] and has separated the organization and functions of central and commercial banks, suggesting that it has changed from a mono to a two-tier system. Secondly, the distinct classification of “cash” and “non-cash” has been weakened. The clear distinction between the two is the unique characteristic of the socialist planned economy. Kim newly established “cash money seats” also allowing companies to withdraw cash through the account. In other words, “non-cash” could be able to function as a currency with some purchasing power.

The first reason for these changes is to normalize North Korea’s public finance function, and the second

09. Changes in the North Korean Electronic Financial System under Kim Jong-un

is the need for changes in the financial system as a lubricant for the operation of market economic factors. High inflation, deepening dollarization, and the development of private loans are critical issues in North Korea. Listed problems keep official finance from functioning, and these are due to the cash leaks. As a result, the distributed cash could not be retrieved and the basic functions of the bank such as money supply and fund brokerage malfunctioned, leading to the development of private over official finance. Therefore, North Korea's recent permission to hold and pay cash based on "cash money seats" and encouragement for residents to use electronic payment cards are functioning as an incentive to raise funds within the system and normalize public financial functions [2].

The second reason was accompanied by changes in the financial sector necessary for the market economy features introduced throughout the economy to operate well. Since came to power, autonomy in production planning and sales in farms and corporations has been expanded. At this point, price liberalization was allowed in sectors that were under the market economy, and people could use "cash" as a payment method.

On the other hand, the development of IT technology has pushed for changes in monetary finance. In the past, the socialist planned economy, including North Korea, tried to monitor corporation's production activities through the flow of cash. To do so, they adopted a "mono banking system", that clearly distinguishes currency circulation and payment methods by "cash" and "non-cash" [3]. With the development of IT technology, however, it has become possible to monitor the overall economy, including inter-company payments based on deposit currencies, and the need to adhere to the mono banking system has weakened [3]. In the past, socialist countries maintained cashless currency for a long time in the process of promoting economic reform, but North Korea was able to pursue change in contrast to this because of the development of IT technology.

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Coding Bootcamp: An Opportunity to Become a Software Developer

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Learning how to code will allow individuals to access several job opportunities and potentially earn lucrative salaries because the skill is highly sought after. According to the Software Policy and Research Institute, there are 9,453 unfilled software developer jobs in 2021 and the number will surge to 14,514 this year [1]. Because it is hard to find prospective employees with excellent coding skills, companies provide competitive salaries and benefits [1]. For instance, Ably, a South Korean online fashion platform, aimed to hire software developers by offering them a high salary with a signing bonus of 100 million KRW [1]. As our world is becoming more digitized, it is no surprise that software developers are in high demand. Luckily, people who did not graduate with a computer science degree who want to become a software developer may not have to go back to an expensive 4-year university to do so. Instead, it is highly recommended for them to attend coding bootcamps.

The curriculum of coding bootcamps is very different to that of university computer science courses [2]. While universities teach the theoretical fundamentals of programming principles, coding bootcamps

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are more career-focused on teaching people programming skills that are relevant in the modern industry from professional programmers [2]. The curriculum revolves around lectures, coding exercises and projects, and collaborative work with other students to build applications [2]. Commonly, the majority of coding bootcamps teach students web development with HTML, CSS, and Javascript because of its low barriers of entry to learn and its high demand in the market [2]. However, different coding bootcamps may teach other programming languages and frameworks to their students depending on their curriculum such as Python and React [3].

Although a coding bootcamp can give an individual the opportunity to become a software developer, there are important points to keep in mind before applying for one. First of all, one must be very sure that it is necessary to attend a coding bootcamp, because classes can be very expensive - a coding bootcamp in Seoul called Vanilla Coding has software engineering courses costing 13.6 million KRW [4]. Furthermore they may require full-time study for 3 to 6 months [2]. For example, a coding bootcamp in Seoul called Wcoding teaches its intensive web development classes from 10:00 AM to 5:00 PM for 12-16 weeks [5]. Focusing on the coding bootcamp would be the utmost responsibility rather than work or family obligations. Last but not least, attending a coding bootcamp does not guarantee a job. For instance, it took a coding bootcamp graduate named Sophia 6 months to finally find a junior software engineering position [6]. After completing the course, prospective job seekers need to practice coding consistently and keep on applying to companies until they get the job.

Attending a coding bootcamp is like a double-edged sword. There are both costs and benefits from attending. However, if an individual is willing to put in the time, effort, and sacrifice to potentially have a foot in the door in the technological industry, a coding bootcamp is an excellent option.

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