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# Technology and an Organization's Business Model

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## INTRODUCTION

The contemporary view of the interconnected digital world began to take shape in the mid-1990s with the commercialization of the Internet.[1] In the early years of the 21st Century, social media companies started to surface.[2] The use of computers and the Internet, combined with social media, have substantially changed the way most companies conduct business when compared to the way business was conducted prior the mid-1990s. The effective execution of this changed business model is based on digital interconnections among computer-based communication systems.

The primary objective of this article is to argue that the business model of contemporary organizations needs to embrace four additional technological developments. These developments are what I have referred to as the ABCD of technology (Gordon, 2018). The acronym ABCD stands for Artificial Intelligence (A), Blockchain (B), Cybersecurity (C), and Data Analytics (D). These four aspects of technology are having a major impact on the way business is being conducted throughout the world. Although each one of these aspects of modern technology can play an independent role in facilitating an organization's success, there are also important interactive effects among these components of technology.

The remainder of this paper proceeds as follows. The next, and second, section provides a brief discussion of what is meant by a *business model* and how computers and the Internet, as well as social media, have already substantially changed the way most companies design and operationalize their business model. The third section of the paper discusses the impact of the ABCD of technology on a firm's business model. The fourth, and final, section of the paper provides some concluding comments.

## THE CHANGING BUSINESS MODEL

At a strategic level, an organization's business model consists of setting its overall objectives, as well as the strategy it employs for achieving those objectives. The way an organization measures the degree to which it is achieving its objectives, as well as the way an organization manages its risk and finances its operations, are also part of an organization's overall business model. In the final analysis, a successful business model needs to be designed to facilitate an organization's ability to create value for its stakeholders. For private sector organizations,

[1] In mid-1990s companies conducting business via the Internet began registering domain names with dotcom in their URL (Uniform Resource Locator).

[2] For example, LinkedIn was launched in 2003, Facebook became open to the public in 2004, YouTube began in 2005, and Instagram was launched in 2010.

revenues, profits, and stock market returns are important performance metrics for assessing whether the firm is creating value for its stakeholders.[3]

At an operational (or tactical) level, a business model needs to include specifying the organization's target market (or markets) and different ways of successfully securing customers (i.e., generating revenues) from the target market. Specifying the company's approach to market penetration also needs to be part of a firm's business model.[4] A business model should also consider the plans and costs associated with the production and distribution of the firm's products.[5]

Prior to the mid-1990s, the activities associated with implementing an organization's business model focused on utilizing brick-and-motor physical facilities, where employees would work and produce products. Physical facilities were also the most common place for organizations to conduct in-person business with their target customers. Penetrating an organization's target market was largely accomplished via marketing activities that were handled by media organizations that made extensive use of print, radio, and TV advertising. Economic success for a private sector firm was traditionally measured in terms of the organization's growth of revenues, and/or profits, and/or stockholders' value. Managing an organization's risk was commonly focused on operational and financial risk management.

Since the mid-1990s, there have been substantial changes to the way most companies operationalize their business model. Online marketing and sales, digital purchasing transactions, and online financial transactions, are now key components of every organization's business model. Virtual work arrangements for employees are also common in today's digital environment (especially since the COVID-19 pandemic). In addition, automation has replaced many jobs that were labor-intense and, in turn, has increased the efficiency of many operations by reducing the costs associated with producing and distributing physical products and services. At the same time, service industries, relative to industries that produce physical goods, have become a much larger share of economies around the world.

Another change in the way many companies currently operationalize their business model is in terms of how they measure economic success and consider risk. Economic sustainability (i.e., economic growth, while minimizing the externalities portion of social costs), has replaced the traditional (i.e., prior to the mid-1990s) approach to measuring economic success in many private sector organizations.[6] A more comprehensive (or holistic) view of managing risk has

[3] Although the basic ideas expressed in this paper about a business model apply to all types of organizations, the focus in this paper is on private sector organizations.

[4] Market penetration refers to the share of the total market doing business with a particular firm.

[5] Products include physical products, as well services.

[6] In economics, social costs are equal to the sum of private costs (i.e., costs borne by the those creating an economic transaction) and externalities (i.e., spillover costs borne by those having no control over the economic transaction). Economic sustainability is a term used to explicitly recognize the fact that economic growth should not cause irreversible harm to the environment and/or society at large. The concept of economic sustainability is consistent with, although not identical to, recent developments related to ESG (environmental, social, and governance) that has become popular in several countries.

also become common, often under the umbrella of ERM (enterprise risk management)[7]. In today's interconnected digital environment, ERM needs to incorporate cybersecurity risk management alongside the other more traditional types of risk (e.g., financial risk, operational risk, compliance risk, etc.).

The above changes to the way companies design and operationalize their business model have been driven, in large part, by computers, the Internet, and social media. In fact, computer-related technological developments have already significantly transformed the landscape for conducting business in today's interconnected digital environment. However, there are at least four computer-related technological developments that are creating a new wave of desirable changes in the business model for contemporary businesses. These latest developments are the ABCD of technology. Individually, and collectively, these technological developments have important implications for the way firms should change their business model to be successful and, in turn, create value for their stakeholders.

## THE ABCD OF TECHNOLOGY AND A FIRM'S BUSINESS MODEL

The term *technology* is usually used to refer to tools or machines used to accomplish a practical task. In today's computer-based environment, the non-physical nature of computers (i.e., computer software) is also considered a key aspect of technology.

It is well known that societies and organizations that have technological superiority have an advantage over less technologically advanced competitors.[8] One of the most important ways to gain technological superiority over competitors in today's digital environment is via computer-related technologies. As noted in the Introduction section of this article, there are four relatively new computer-related technologies that, if properly integrated into an organization's business model, have the potential for creating value for an organization via technological superiority. These developments are the ABCD of technology.

The acronym ABCD was initially introduced in an article on the impact of technology on contemporary accounting by Gordon (2018). The articles by Glen et al. (2018-2019) and Wetklow (2023) provide insightful applications of the ABCD of technology perspective to financial management. The current article builds upon the above noted earlier papers that focused on the importance of the ABCD of technology to accounting and financial management. This article, however, takes a broader perspective and argues that, in today's interconnected digital environment, organizations need to revamp their business model to embrace the ABCD of technology. A discussion of the potential impact of each one of these technologies on a firm's business model is provided below.

*Artificial intelligence* (usually referred to as AI) refers to the idea that machines (especially computers) can learn to perform tasks which require intelligence. These tasks are often associated with a human being's ability to conduct deductive and inductive reasoning, solve

[7] For example, see COSO (2017).

[8] The importance of technology to societies goes back at least as far as the stone age (e.g., see: https://en.wikipedia.org/wiki/History_of_technology).

problems, and make predictions. Traditionally, such tasks were considered the sole domain of human beings. Although the modern-day view of AI dates back to the mid-1950s, to reach its real potential AI required computers that could store vast amounts of data and process that data at speeds far beyond what was available at the time when AI was first being developed.[9] Today, however, computers can store more than one terabyte of data and process billions of instructions (super computers can process trillions of instructions) per second.[10] As a result, AI has become one of the fastest growing fields of study, with new developments surfacing at an exponential rate. Many organizations currently use *machine learning* (ML) models, which are a subset of AI models, to facilitate a variety of business decisions.

The computer algorithms developed via AI models can simulate the way human beings solve problems and make decisions concerning the various components of an organization's business model. For example, AI is being used to develop new products, explore new target markets and marketing strategies, address and predict customer concerns, and assess various capital structure issues. [11] AI also has the potential for improving the way a firm assesses its performance and manages its risk.[12] In addition, it is commonly argued that AI can improve the quality of life for employees of a company by eliminating the need to focus on mundane tasks. AI also has the potential for improving the quality of life for society at large (e.g., in terms of healthcare, environmental concerns, etc.).[13] More generally, AI is rapidly becoming a key driver of economic efficiency and sustainability for many organizations operating in today's interconnected digital world. In sum, AI is clearly changing the way organizations operationalize their business model, as well as address strategic issues.

*Blockchain* refers to a decentralized ledger consisting of blocks of transactions that are distributed among the members of the blockchain. The blocks in the blockchain are connected by a system of unique encrypted links (called hash function links). Information in a blockchain becomes available to all members of the blockchain at the time of being posted. Changing information in a block is extremely difficult because it requires a majority of the parties to transactions in subsequent blocks within the chain to accept the change. The data associated with the transactions in each block of the blockchain are also encrypted. Thus, a large blockchain is usually more secure than a traditional centralized ledger system, thereby resulting in a reduction of cyber risk.

A private blockchain is limited to specific members. A central authority controls the membership and the rights of each member. Private blockchains have already gained popularity in many businesses and are changing the way firms operationalize their business model. This latter point is especially true among supply-chain partners. Smart contracts, for

[9] For an interesting discussion of the history of AI, see: https://en.wikipedia.org/wiki/History_of_artificial_intelligence.
[10] One terabyte of data is equal to 1000 gigabytes of data. A gigabyte of data is equal to around one billion bytes of data, where a byte of data is equal to eight binary digits long.
[11] ML techniques involve a process whereby computers develop algorithms (i.e., programs) based on large sets of empirical data (i.e., training data).
[12] For an interesting discussion on how AI can help an enterprise manage its risk, see COSO (2017).
[13] For a balanced discussion of the main pros and cons of AI for society, the reader is referred to the article by ProCon.org at: https://www.procon.org/headlines/artificial-intelligence-ai-top-3-pros-and-cons/.

example, between supply-chain partners that are based on private blockchains provide the partners to the contracts added transparency and security. In addition, the self-executing aspect of smart contracts means that intermediaries are eliminated. The elimination of intermediaries changes the way a business operates (i.e., it changes a firm's business model) and makes the transactions more efficient than traditional contracts.

Unlike a private blockchain, a public blockchain is open to the public and there is no central authority controlling the blockchain. Most cryptocurrencies transactions, for example, are facilitated via a public blockchain. The challenges associated with public blockchains (e.g., lack of regulations, concern for privacy, and problems associated with the interoperability of various computer hardware and software systems), have impeded the widescale use of public blockchains.

Although data in a large blockchain is usually considered more secure than data in a traditional centralized ledger system, there are some potential disadvantages of using blockchains. These disadvantages include the fact that it is difficult to make corrections or adjustments to the data in the blockchain. Furthermore, due to the verification process among all the nodes of a blockchain, the processing speed of a blockchain may be slower than a centralized database. The above challenges and disadvantages notwithstanding, blockchain technology is clearly changing the way organizations operationalize their business model.

*Cybersecurity* refers to the protection of information that is accessed or transmitted via computer networks (including the Internet). As discussed by Gordon (2018, pp. 11-12), "Cybersecurity is concerned with the protection of information accessed and transmitted over the Internet and other computer networks. The primary objectives of cybersecurity are to protect the confidentiality, integrity, and availability (often referred to as CIA) of information. Protecting the confidentiality of information essentially means protecting private information from those that are not authorized to see or use the information. Protecting the integrity of information essentially means protecting the accuracy, reliability, and validity of information. Protecting the availability of information essentially means making sure that information is available to authorized users on a timely basis. Two other objectives of cybersecurity that are often considered a subset of availability are authentication and nonrepudiation. Authentication refers to the notion that information has been made available to an authorized user whose identity has been authenticated. Nonrepudiation refers to the notion that an authorized user's identity cannot be repudiated."

Cybersecurity risk is a fundamental concern to all computer-based information networks. Indeed, the number of cyber breaches affecting organizations in today's interconnected digital environment has been growing at an exponential rate over the last few decades (Gordon et al., 2011). In essence, cybersecurity is like an invisible thread that holds our digital interconnected communication systems together. The invisible nature of cybersecurity does, however, become quite visible when a cyber-breach occurs. As Gordon (2022, p. 74) noted: "Although largely invisible, once a major cyber breach occurs the lack of cybersecurity quickly becomes visible."

Cybersecurity plays a significant role in the way successful organizations operationalize their business model in today's interconnected digital world. Indeed, cybersecurity can be thought of as the glue that connects all aspects of computer-based technologies. Without cybersecurity, cyber breaches would be ubiquitous and, in turn, cause major problems for a firm's sales, production of goods and services, as well as the distribution of those goods and services. Recent studies have shown that the potential for cybersecurity breaches has become one of the, if not the, most important risk factors confronting organizations (e.g., see Allianz, 2023). Thus, cybersecurity risk management, which plays a pivotal role in preventing devastating cyber breaches that could threaten the overall financial and economic sustainability of a firm, is now a topic of the upmost concern to corporate senior executives and Board of Directors. Given the growing importance in the way cybersecurity has directly affected a firm's business model, it is critical for firms to determine the appropriate amount to spend on cybersecurity-related activities.[14]

*Data analytics* refers to the process of analyzing and drawing inferences from large sets of empirical data. The goal underlying the process of data analytics is to gain insight from these large data sets that would otherwise go unnoticed. As Richardson et al. (2021, p. 4) point out, "…effective Data Analytics provides a way to search through large structured and unstructured data to discover unknown patterns or relationships." Accountants and statisticians have been analyzing and drawing inferences from data sets for centuries. However, the amount of data available in today's digital environment, and the developments related to high-speed computers that have huge memory and storage capacity, have changed the nature of data analytics. In addition, sophisticated visualization software is also part of the modern view of data analytics. Thus, the contemporary approach to data analytics is based on the analysis of very large data sets (often referred to as big data) via high-speed computers that incorporate sophisticated statistical analyses and advanced visualization software. Machine learning models are also often used in the contemporary view of data analytics.

Effective utilization of data analytics changes the way decisions related to an organization's business model are made, as well as the strategy used to achieve the firm's overall objectives. For example, data analytics is particularly useful in analyzing target markets, developing marketing strategies, and predicting the changing needs of customers. Data analytics can also improve the operational efficiency associated with producing products and services, as well as in terms of analyzing distribution channels. Data analytics can also play an important role in analyzing issues related to a firm's performance measures, enterprise risk management, and capital structure issues. Thus, data analytics is clearly changing the way organizations operationalize their business model and create value for their stakeholders.

The above four aspects of technology (i.e., the ABCD of technology) are changing the business model for many companies. In fact, organizations that do not incorporate the ABCD of

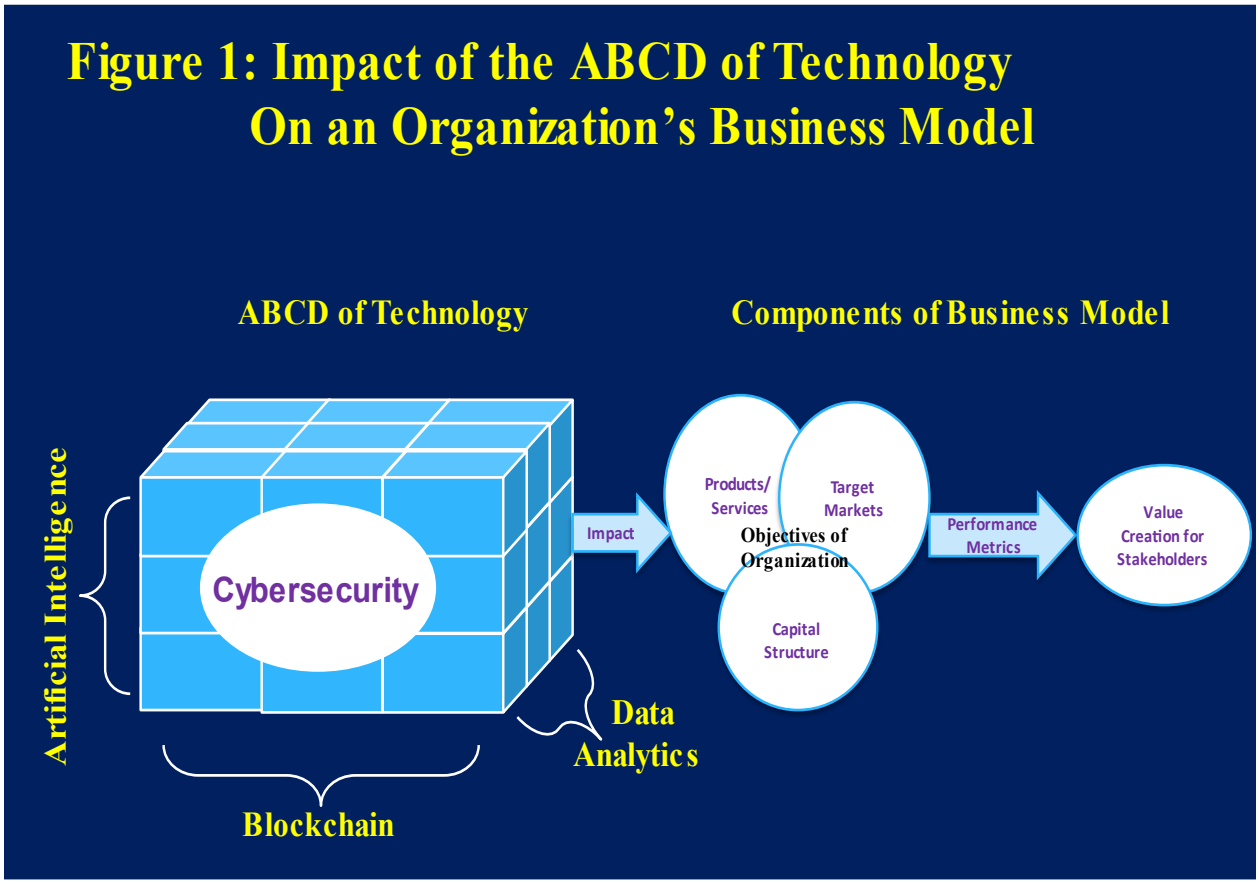
[14] Ever since the SEC (Securities and Exchange Commission) issued its Disclosure Guidance concerning cybersecurity risks and cyber incidents (SEC, 2011), the reporting requirements concerning cybersecurity risks and cyber incidents have been a key concern to firms. Determining the optimal amount that firms should invest in cybersecurity-related activities is an issue of particular concern in this regard ((e.g., see Gordon and Loeb, 2002).

technology into their business model are likely to fall prey to technologically superior competitors.

One way to visualize the impact of AI, blockchain, cybersecurity, and data analytics on the components of the business model is illustrated in Figure 1. In today's digital environment, technological superiority will largely be determined by the successful application of these four aspects of technology to an organization's business model.

## CONCLUDING COMMENTS

Nobel Laureate Albert Einstein is often credited with having stated that "imagination is more important than knowledge."[15] The argument underlying this quote is that while knowledge has limits, imagination has no boundaries. However, imagination and knowledge are typically inextricably interwoven. Indeed, whereas imagination leads to new knowledge, knowledge is typically the basis for imagination. Nowhere is this symbiotic relationship between imagination and knowledge more apparent than in areas related to technology.




The great technological advances over the last three centuries (e.g., steamboat, train, automobile, telephone, television, airplane, computer, Internet, spaceship, smart phone, etc.)

[15] For example, see goodreads.com at: https://www.goodreads.com/quotes/556030-imagination-is-more-important-than-knowledge-for-knowledge-is-limited.

were all the result of an evolutionary iterative process between imagination and knowledge. It is this iterative process between knowledge and imagination that has led to today's interconnected computer-based digital world. Artificial intelligence, blockchain, cybersecurity and data analytics are among the latest technological developments resulting from this iterative process between imagination and knowledge. In future decades, we can anticipate experiencing equally impactful changes in technology.

As discussed earlier in the paper and illustrated in Figure 1, the goal of a business model is to facilitate an organization's ability to create value for its stakeholders. Although not a panacea, organizations that integrate the ABCD of Technology into their business model have a better chance of surviving in today's highly competitive markets. In fact, embracing the ABCD of Technology may well be a necessary, although not sufficient, condition for firms to enjoy economic sustainability in today's interconnected digital economy.

## References

Allianz, "Allianz Risk Barometer 2023: Cyber & business interruptions top threats as economic and energy risks rise," Jan 17, 2023, (tps://www.allianz.com/en/press/news/studies/230117_Allianz-Risk-Barometer-2023.html).

COSO (Committee of Sponsoring Organizations of the Treadway Commission), "Enterprise Risk Management Integrating with Strategy and Performance," Executive Summary, June 2017 (see: https://www.coso.org/_files/ugd/3059fc_61ea5985b03c4293960642fdce408eaa.pdf).

Glenn, D. A., J. B. Hill and M. Wetklow, "The ABCDs of Technology and Impacts on Federal Financial Management: A CFO Community Perspective," Journal of Government Financial Management, Winer 2018-2019, Vol. 67, No. 4, pp. 41-47.

Gordon, L. A., "The invisible thread in our digital world," DATAQUEST, June 2022, pp. 72-74.

Gordon, L.A., "The Impact of Technology on Contemporary Accounting: An ABCD Perspective," *Transactions on Machine Learning and Artificial Intelligence*, Vol. 6, No. 5, 2018, pp. 10-16.

Gordon, L. A. and M. P. Loeb, "The Economics of Information Security Investment," ACM Transactions on *Information and System Security*, November 2002, pp. 438-457.

Richardson, V., K. Terrell, R. Teeter, Data Analytics for Accounting, 2nd Ed., McGraw-Hill, Inc., 2021.

Wetklow, M., "Accounting: The Need for STEAM," Journal of Government Financial Management, Spring, 2023, pp. 10-16.