Research Paper

Deekshith Kodem

Christian Brothers University

ECIS 635: Management of Information Systems

Dr. Harichand Nair

November 6, 2021

**ABSTRACT**

The purpose of the paper is to explain and give a brief introduction about ML & AI, BLOCKCHAIN, IoT, ERP SYSTEMS, SOFTWARE TRENDS IN IT, DISRUPTIVE TECHNOLOGIES, CLOUD COMPUTING, INFORMATION TECHNOLOGY JOBS, AND SKILLS REQUIRED FOR THOSE JOBS, PROGRAMMING LANGUAGES, PROJECT MANAGEMENT IN IT..

**Project Management in IT**

IT project management (ITPM) is the planning, scheduling, execution, monitoring and reporting of IT projects. While many industries focus exclusively on IT projects, IT is unique in that most, if not all, industries have some level of an IT component.

Since they are often very wide in scope, IT project managers must deal with risk, interdependent integrations, software updates, scope creep and so on. Therefore, IT projects require more than the typical project management tools and skills to complete.

Specialized IT project management software complete with online Gantt charts, kanban boards, dashboards and reports provide the essential functions necessary for successful IT projects (Haider & Syed, 2019).

An IT project manager is responsible for overseeing an organization’s IT department and managing teams to execute IT projects on time and within budget. Some of the duties of an IT project manager include:

* Setting project goals and creating plans to meet them
* Maintaining the project schedule and budget, creating status reports
* Managing resources, including the team, equipment, etc.
* Assigning tasks to team members
* Developing strategy to deliver projects on time and within budget
* Using IT project management tools to track progress and performance
* Assessing risk and responding adequately
* Leading regular meetings with team and stakeholders

“*IT project managers are expected to have advanced knowledge of computers, operating systems, network, and service desk administration*.” (Haider & Syed, 2019, p.32). They must also be good communicators and be able to clearly explain complex technical issues. Other required skills include experience with scheduling, budgeting, and resource planning.

While the skill sets of project managers across different industries are generally the same, an IT project manager is unique in that they’re focused solely on the IT needs of an organization. But like all project managers, the way an IT project manager handles their varied duties and responsibilities is with the help of robust IT project management software.

The IT project manager, due to the breadth of IT project management, has a wider range of responsibilities than most other project managers. They are not only dealing with leadership, resource allocation, scheduling and planning, monitoring and reporting, but must know about technology beyond the tools that they use to manage projects.

IT project managers are responsible for understanding firmware and being able to implement software integrations. They often build websites and databases and manage these technologies as well. This includes building networks and maintaining security for data risks (Albertin, 2000).

However, the basic structure of the IT project manager’s job remains being a clear communicator, setting realistic goals and applying the right methodology to achieve them. They must motivate and inform both teams and stakeholders, manage change and set the project schedule. The triple constraint of any project is still present. Therefore, the IT project manager, like any project manager, is concerned with setting deadlines and keeping to a budget. This is all managed through methodology.

**Programming Languages**

Computer programming languages allow us to give instructions to a computer in a language the computer understands. Just as many human-based languages exist, there are an array of computer programming languages that programmers can use to communicate with a computer. The portion of the language that a computer can understand is called a “binary.” Translating programming language into binary is known as “compiling.” Each language, from C Language to Python, has its own distinct features, though many times there are commonalities between programming languages.

*“These languages allow computers to process large and complex swaths of information quickly and efficiently.”* (Freitas, Luciano & Testa, 2003, p.28). For example, if a person is given a list of randomized numbers ranging from one to ten thousand and is asked to place them in ascending order, chances are that it will take a sizable amount of time and include some errors

There exist several programming languages with their own specific purpose and contains a unique set of keywords and syntax that are used to create instructions. The programming language varies in the level of abstraction and classified into two categories:

* Low-level language
* High-level language

Low-Level Language:

Low-level languages provide abstraction from the hardware and are represented in the binary form i.e. 0 or 1 which are the machine instructions. Low-level languages are further classified as machine-level language & assembly level language.

High-Level Language:

*“High-level language allows us to write programs that are independent of the type of computer.”* (Freitas, Luciano & Testa, 2003, p.42). The high-level languages are named as high-level because they are close to human languages and can be understood easily, however it requires attention to the logic of the problem. The language needs a compiler to translate a high-level language into a low-level language. Further, the high-level languages provide the following advantage.

**Information Technology Jobs and Skills Required for those Jobs**

Information technology (IT) involves the use of computers, storage, and networking devices to create, lab process, store, share and secure electronic data. It is a fast-growing field, due largely to the high demand for IT services across all industries. IT degree programs prepare students to earn potentially lucrative salaries while working for IT departments and consulting firms. The median annual wage for IT careers was $81,430 in May 2015, according to the U.S. Bureau of Labor Statistics, considerably higher than that for all occupations. Read more to learn how to get started in the field of IT, from the various types of careers available to the degrees necessary to secure employment.

It’s hard to go wrong with a technology degree. According to the National Association of Colleges and Employers, computer science is the STEM major with the highest job offer and job acceptance rate. Perhaps that’s why a recent CareerBuilder survey revealed that from in the 2010s, the number of students completing science technology degrees grew by nearly 50%, and the number of computer and information science students rose by almost one-third, making these two degrees among the fastest growth rates in the U.S.1﻿

A degree in a computer-related field can lead to a variety of well-paying and high-demand jobs. The best tech jobs pay significantly more than the average median wage of $34,750 and have projected growth rates that are faster than the 11% overall rate anticipated for the average U.S. job (Luciano, 2003).

By sorting through data from several sources, including the U.S. Bureau of Labor Statistics (BLS) and jobs website Glass Door, we compiled the following list of the ten best tech jobs.

* Data Scientist.
* Software Developer.
* Information Security Analyst.
* Computer Systems Analyst.
* Web Developer.
* Sales Engineer.
* Information Technology Manager.
* Computer Research Scientist.

Technology is one of the fastest-growing and most in-demand industries. Use this list as a guide to evaluate the job outlook, salary, and education requirements for your dream tech job.

**Cloud Computing**

In the simplest terms, cloud computing means storing and accessing data and programs over the internet instead of your computer's hard drive.

Ultimately, the cloud is just a metaphor for the internet. It goes back to the days of flowcharts and presentations that would represent the gigantic server-farm infrastructure of the internet as nothing but a puffy cloud, accepting connections and doling out information as it floats.

*“The cloud is also not about having dedicated network attached storage NAS device in your house.*” (Paul & Timmers, 1999, p.63). Storing data on a home or office network does not count as utilizing the cloud. However, some NAS devices will let you remotely access things over the internet, and there's at least one brand from Western Digital named My Cloud, just to keep things confusing.

For it to be considered cloud computing, you need to access your data or your programs over the internet, or at the very least, have that data synced with other information over the web. In a big business, you may know all there is to know about what's on the other side of the connection; as an individual user, you may never have any idea what kind of massive data processing is happening on the other end in a data center that uses more power in a day than your whole town does in a year. The result is the same: with an online connection, cloud computing can be done anywhere, anytime.

There is an entirely different "cloud" when it comes to business. Some businesses choose to implement Software-as-a-Service (SaaS), where the business subscribes to an application it accesses over the internet. (Think Salesforce.com.) There's also Platform-as-a-Service (PaaS), where a business can create its own custom applications for use by all in the company. And don't forget the mighty Infrastructure-as-a-Service (IaaS), where players like Amazon, Microsoft, Google, and Rackspace provide a backbone that can be "rented out" by other companies. (For example, Netflix is a customer of the cloud services at Amazon.)

Of course, cloud computing is big business. Our partners at Statista created this chart in February 2020 showing Amazon's dominance in the $100 billion a year business. That, of course, was a month before the COVID-19 coronavirus shut down a lot of businesses—which then transferred their cloud computing to the home, seamlessly for the most part.

But that's in the US and thus represents only a slice of the cloud pie. If you take the worldwide use into account, the market is worth far more. It was $272 billion in 2018, and expected to be worth $623.3 billion by 2023, according to Markets and Markets.

**Disruptive Technologies**

“*Disruptive technology is the technology that affects the normal operation of a market or an industry. It displaces a well-established product or technology, creating a new industry or market.:”* (Barry & Hawk, 2015, p.34). A professor at Harvard Business School, Clayton M. Christensen, invented the term disruptive technology.

New technology can either be sustaining or disruptive. While sustaining technology depends on the incremental improvements in the already existing technology, disruptive technology is a completely new one. Hence, the practica l application of such types of technology may not have been proven yet.

Also, disruptive technologies often attract a small audience and generate performance problems. They do not occur frequently; however, they are more suitable for long-term use.

They may not be able to fulfill the demands of the high-end market initially, but they exceed market expectations when it appears to be profitable. Disruptive technologies are generally originated from startups and young companies rather than the leading companies (Barry & Hawk, 2015).

Making a Disruptive Technology Success

According to Clayton Christensen, disruptive technology becomes successful because of the following:

1. Business models should be innovative

The business model targeting low-end customers, or a new segment of customers will aid in the success of disruptive technology.

2. Value network

When it succeeds, a network of suppliers, customers, and distributors also prosper.

3. Enabling technology

The disruptive technology should be able to make products accessible and affordable to a bigger audience.

Well-established companies focus on efficiency improvement and lack sufficient time for preparing for a disruptive technology appearance. On the contrary, startups or young companies are generally risk-taking companies. They identify the capability of disruptive technology and look for ways to incorporate the same in the business. However, preparing for the disruption is difficult, as they tend to appear suddenly.

Additional Resources

CFI is the official provider of the global Commercial Banking & Credit Analyst certification program, designed to help anyone become a world-class financial analyst. To keep advancing your career, the additional resources below will be useful:

* Bitcoin Mining
* Distributed Ledger Technology
* Knowledge Engineering
* Value Network

**Machine Learning and Artificial Intelligence**

“*The word Artificial Intelligence comprises of two words Artificial and Intelligence. Artificial refers to something which is made by human or non-natural thing and Intelligence means ability to understand or think*.” (Gillies & Lorna, 2008, p.65). There is a misconception that Artificial Intelligence is a system, but it is not a system .AI is implemented in the system. There can be so many definitions of AI, one definition can be “It is the study of how to train the computers so that computers can do things which at present human can do better. Therefore, It is a intelligence where we want to add all the capabilities to machine that human contain.

Machine Learning is the learning in which machine can learn by its own without being explicitly programmed. It is an application of AI that provide system the ability to automatically learn and improve from experience. Here we can generate a program by integrating input and output of that program. One of the simple definitions of the Machine Learning is *“Machine Learning is said to learn from experience E w.r.t some class of task T and a performance measure P if learners’ performance at the task in the class as measured by P improves with experiences.”* (Gillies & Lorna, 2008, p.96).

**Internet of Things**

The Internet of Things refers to physical items (or groups of such devices) that are embedded with sensors, processing power, software, or other technologies (IoT). Data is sent to and from other devices and systems using the internet or other communication channels. *“Imagine a world where physical objects can seamlessly integrate into the information network and participate actively in business processes. Over the Internet, it is possible to interact with the 'smart objects', query their status and view any associated information, taking security and privacy precautions into account.”* (Haller,Karnouskos & Schroth, 2004, p.15).

How does IoT work?

A web enabled IoT ecosystem is made up of smart devices with embedded systems that capture, communicate, and act on the data they collect from their surroundings. Data from IoT devices is shared through a gateway or other edge device, which either sends it to the cloud or analyzes it locally. These devices occasionally connect with one another and rely on the information they receive. People can still interact with the gadgets, for example, to set them up, give them instructions, or access data, even though they accomplish most of their work without human intervention.

IoT Architecture consists of 4 stages

STAGE 1

Sensors and Actuators

Sensors and actuators are two types of connected devices that monitor (sensors) or operate (actuators) a physical process or an item. Sensors collect data on the environment's temperature or another process and send it to an actuator. (Jahnke, 2020).

STAGE 2

Internet Gateways and Data Acquisition Systems

Analog sensor data is collected by a data acquisition system (DAS) and converted to digital data by a conversion system. A DAS then aggregates and formats the data before sending it through an Internet gateway via wireless WANs (such as Wi-Fi or cellular) or wired WANs for further processing. (Jahnke, 2020)

STAGE 3

Pre-processing: Analytics at the Edge

IoT data must be handled before it can be sent to a data center or cloud after being digitized and aggregated. As part of the pre-processing, the edge device could run some analytics. Machine learning can provide feedback that may be used to continually improve the process without having to wait for orders from the corporate data center or the cloud. Processing is frequently carried very close to the sensors, such as in a wire closet on the job site.

STAGE 4

In-depth Analysis in the Cloud or Data Center

The following steps in the process include data analysis, management, and data security. Furthermore, data from numerous field sites and sensors can be pooled in a corporate data center or in the cloud to provide actionable insights to IT and business managers. Companies can utilize IoT data to recognize trends and patterns in multiple areas, as well as detect anomalies that may develop because of differing operations in different geographies.

Why is IoT important?

Organizations can reap the benefits of IoT in several ways. Some benefits are industry-specific, and others can be applied across multiple industries:

• Monitor their business processes on a regular basis.

• Enhance the customer experience (CX).

• The system is cost-effective and timesaving.

• It also boosts employee productivity.

• Business models should be integrated and adapted.

IoT enables organizations to rethink their operations and provides them with the tools they need to strengthen consumer connections. IoT is most common in manufacturing, transportation, and utility enterprises, where sensors are commonly employed in the working environment; however, IoT has also found uses in agriculture, infrastructure, and home automation, prompting some businesses to embark on digital transformation. The Internet of Things (IoT) has the potential to make farming more efficient and productive. We may use sensors to monitor rainfall, humidity, soil moisture, temperature, and a variety of other variables, as well as automate farming operations.

Consumer Applications

• Smart home

• Eldercare

Organizational Applications

• Medical and Healthcare

• Transportation

• V2x communication

• Building and home automation

• Industrial Applications

• Manufacturing

• Agriculture

• Food

• Maritime

• Military Applications

• Internet of Battlefield Things

• Ocean of Things

• Product digitization

Drawbacks of IoT

• Security flaws

• Associated costs

• Power supply dependence

• Network dependence

• High skill requirements

**BLOCKCHAIN**

In business, blockchain facilitates the recording of transactions and tracking of assets. The assets in a network may be tangible (a house, car, cash, land) or intangible (patents, copyrights, branding). Any object of value can be tracked using the blockchain, reducing risk and lowering costs for all parties. *“A blockchain can be defined from a business perspective as a distributed platform that allows peer-to-peer exchanges of values without the need for a central trusted arbitrator.*” (Mahbubur & Syed, 2000, p.92). Upon understanding this concept, readers will have a new appreciation for the full potential of block technology. This allows blockchain to be a decentralized consensus mechanism where no single authority is responsible for managing the database. Blockchain is a data structure that consists of a collection of blocks that are chained together to form a ledger, with cryptography being a key component of this process. Unlike a database, a blockchain doesn't have a storage mechanism; instead, it has a set of protocols that govern what information can be forged. As a result, a blockchain can be stored in flat files or in a database.

This refers to a ledger that can only be read and added to as blocks can only be added to it. Blocks in a blockchain can never be modified or removed; they can only be added to the end (Mahbubur & Syed, 2000).

**Key elements of a blockchain**

Distributed ledger technology:

This shared ledger gives all network participants access to an immutable record of transactions, avoiding the duplication of effort seen in traditional commercial networks and allowing transactions to be recorded only once.

Immutable records:

After a transaction has been logged to the shared ledger, it cannot be changed. A new transaction must be added to counterbalance an inaccuracy in a transaction record, and both transactions are then visible.

Smart contracts:

Smart contracts, which cover everything from corporate bond transfers to travel insurance, are stored on the blockchain and can be implemented automatically.

How blockchain works

• As each transaction occurs, it is recorded as a “block” of data

A data block can hold almost anything as long as it defines who, what, when, where, how much, and in what condition, such as the temperature of the food shipment. Transactions can be physical (i.e., a product) or intangible (i.e., a service) (information). Every block is connected to the ones before and after it

*“Investing and acquiring assets require information regarding their movements from one location to another, as well as confirming events and protecting them against alteration or interception.”* (Fernandes, 2013, p.72).

• An irreversible chain is formed between transactions: a blockchain

Since every subsequent block increase in strength, the chain is immutable and malicious actors can't alter the ledger, so you and other members can trust the record.

Advantages of Blockchain

• As a public digital ledger, it can never be modified once it is recorded.

• As a result of Blockchain's encryption feature, it is always secure

• Due to automatic ledger updates, the transactions are instantaneous and transparent

• The system is decentralized, so no intermediary fee is required

• By participating in the transaction, participants verify and confirm the transaction's authenticity.

**Enterprise Resource Planning**

“*Enterprise resource planning (ERP) is a process used by companies to manage and integrate the important parts of their businesses. Many ERP software applications are important to companies because they help them implement resource planning by integrating all of the processes needed to run their companies with a single system*.” (Allen & Leilani, 1996, p.75). An ERP software system can also integrate planning, purchasing inventory, sales, marketing, finance, human resources, and more.

Enterprise resource planning (ERP) manages and integrates business processes through a single system. With a better line of sight, companies are better able to plan and allocate resources. Without ERP, companies tend to operate in a siloed approach, with each department operating its own disconnected system (Allen & Leilani, 1996).

ERP systems usually fail to achieve the objectives that influenced their installation because of a company's reluctance to abandon old working processes that are incompatible with the software. Some companies are also reluctant to let go of old software that worked well in the past. The key is to prevent ERP projects from being split into many smaller projects, which can result in cost overruns.

ERP systems promote the free flow of communication and sharing of knowledge across an organization, the integration of systems for improved productivity and efficiencies, and increased synergies across teams and departments. However, moving to an ERP system will be counterproductive if the company's culture does not adjust with the change and the company does not review how the structure of its organization can support it.

**References**

Albertin, A. 2000. *Journal of Internet Banking and Commerce,* 21(2), 25-63. Retrieved November 6, 2021, from ProQuest database.

Alec Jahnke, Sales Engineer, Digi International (July 31,2020)

Anthony So, Thomas V. Joseph, Robert Thas John, Anthony So, The Data Science workshop from CBU Library.

Allen, H. & Leilani, E. 1996. An empirical study of factors affecting e-commerce. *Journal Information Technology for Development*, 21(4), 53-95. Retrieved November 11, 2021, from Emerald database.

Boar, B. H. (1997). Strategic thinking for information technology from ProQuest database

Banerjee, A., Madden. & G. Rappoport, N. 1998. E-commerce transactions, the installed base of credit cards, and the potential mobile E-commerce adoption. Applied Economics, 49(1). 21-32. Retrieved November 14, 2021, from ProQuest database.

Barry, M. & Hawk, E. 2015. Law and Commerce in Pre-Industrial Societies. *Journal of Business Research,* 56(2), 736-928. Retrieved November 7, 2021, from Emerald database.

Campbell, D. & Wells, J. 2002. Understanding preadoption e-commerce attraction. *Information System Research*, 24(2), 219-238. Retrieved November 14, 2021, from ProQuest database.

Craig, F. & Standing, T. 2004. Technological and organizational factors influencing. *International Journal of Business and Society,* 5(3), 23-68. Retrieved November 11, 2021, from Emerald database.

Fernandes, L. 2013. Fraud in electronic payment transactions: Threats and countermeasures. *Asia Pacific Journal of Marketing and Management Review*, 2(3), 23–106. Retrieved November 8, 2021, from ProQuest database.

Freitas, K., Luciano, B. & Testa, P. 2003. Understanding the determinants of adoption: Evidence from manufacture sector. *Indian Journal of Science and Technology,* 9(10), 21-56. Retrieved November 6, 2021, from ProQuest database.

Gillies, T. & Lorna, E. 2008. Electronic and International Private Law: A Study of Electronic Consumer Contracts. *IEEE International Conference on Management of Innovation and Technology*, 14(12), 436-441. Retrieved November 8, 2021, from Emerald database.

G. Schepens,1998 from ProQuest database book name Benefits of information technology

Herrero, A. & Martin, S. 2012. Effects of the risk sources and user involvement on adoption. *Journal of Risk Research*, 15(7), 53-84. Retrieved November 11, 2021, from Emerald database.

Haller Stephan, Karnouskos Stamatis & Schroth Christoph, The Inter of Things in an Enterprise Context, Berlin 2009.

Imran Bashir, Mastering Blockchain, Published by Packt Publishing Ltd, Birmingham,UK.

Mahbubur, R. & Syed, S. 2000. Opportunity and Challenges. *Journal of Global Information Management*, 20(3), 23–54. Retrieved November 8, 2021, from Emerald database.

Paul, S. & Timmers, F. 1999. Strategies and Models for B2B Trading. *Journal of Theoretical and Applied Information Technology,* 89(2), 422–438. Retrieved November 8, 2021,

Koshik Raj, Foundations of Blockchain : The Pathway to Cryptocurrencies and Decentralized Blockchain Applications, Birmingham, 2019, from CBU Library

L. Wang, Laszewski, A. Younge, X. He, M. Kunze & J. Tao C. Fu,2008, new generation computing from ProQuest database.

from ProQuest database.

Saffu, J. & Walker, K. 2012. Perceived strategic value and adoption. 11(1), 20-58. Retrieved November 14, 2021, from ProQuest database.