

A Study on the Impact of Artificial Intelligence on the Span of Control and Change Management in a Managerial Setting

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Abstract

a. Purpose - This research paper fulfils a purpose of manifold dimensions, the foremost and major one being the intersection of disruptive technology and organisational management. While there is a vast portion of uncharted territories and unexplored dimensions, the right conversation have been stirred by the prominent technology and management researchers.

This paper aims to serve as a contribution towards the most novel and still emerging research on disruptive technologies and its integration in organisational management. The author of this paper is making an attempt at encouraging prospective research avenues to consider embracing technological advances, artificial intelligence, and machine learning in management and business research areas.

b. Implications of the Study

This research study will openly create several avenues for novel yet inevitable research in domains of technology and business management. This will encourage a flow of research ideas on the productive effects on collaboration between artificial intelligence and human intelligence.

More specifically, the goals of this study are to conduct a research to examine the reality of artificial intelligence adoption in the microcosm and the macrocosm of the business and organisational world. Finally, this paper aims to help understand the emerging trends in managerial technology as well as the evolving functional position of managerial operations.

c. Originality/Value of the Study –

This paper presents the role of artificial intelligence in enhancing the efficacy of managerial decision making. The primary focus is to study the current trends as well as impact on the managerial ecosystem in the future of the management world. The study has been conducted through various journal articles, review essays, articles and other major secondary sources of information.

d. Findings –

Business adoption of AI will change the definitions of various job profiles. Machines and human workforces must be looked at as collaborative forces in order to yield maximum benefits. It has been observed that augmentation of human work by smart machines has been far more common than large-scale automation as mentioned in HBR by Wilson and Daugherty. Therefore, according to Mark Knickrehm, organizations need to begin preparing employees to work alongside smart machines and add value to their efforts.

Keywords – artificial intelligence, span of control, artificial intelligence and management, augmentation, automation, predictive

I. INTRODUCTION

Artificial intelligence, machine learning and disruptive technologies are the buzzwords today, but the conception of their theoretical and even the practical existence is not almost as old as the end of World War II.¹ Today the integration of technology in everyday life in everyday life is inevitable and it has not yet realised its full potential.

Artificial intelligence and the principles of machine learning cannot be defined better by none other than Alan

Turing himself, “Artificial intelligence (AI) is wide-ranging branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence. AI is an interdisciplinary science with multiple approaches, but advancements in machine learning and deep learning are creating a paradigm shift in virtually every sector of the tech industry.”

Span of control “also called span of management, is the term used in business management, particularly human resource

¹ The brilliant Alan Turing made the first machine built on the principles of what today is known as machine learning. The word “Turing Test” arises from the same.

management. The term refers to the number of subordinates or direct reports a supervisor is responsible for.” To explain in more precise and simple words the work span of control refers to the number of subordinates that can work under a superior or a supervisor.

Change management is essentially an umbrella term and refers to the various activities that are involved in preparing, helping, and supporting individuals, teams, personnel, workforce and the organisation in developing, understanding, examining, and analysing organisational change.

There are several drivers on change in an organisation which include, but are not limited to, evolution of technology, review of internal processes and external processes, changes of demands of customers, pressure from competition, restructuring, and mergers and acquisitions or similar deals. “It deals with many different disciplines, from behavioural and social sciences to information technology and business solutions.” It includes taking care of aforementioned processes by devising appropriate methods and frameworks of decision making processes while managing change.

Research Questions

1. What are the different methods or forms of artificial intelligence and subsequent disruptive technologies that can change the course of management process in an organisation?
2. How is artificial intelligence related to span of control? How does artificial intelligence help or assist in managing change in an organisation?
3. What are the implications and advantages of integrating artificial intelligence and disruptive technologies?
4. How does the growth trajectory of an organisation is manifested after integrating artificial intelligence and advance on the principles of augmented assistance offered by disruptive technologies and artificial intelligence?

Research Objectives

1. To study the forms in which disruptive AI technology can contribute in an organisational setting.
2. To analyse the advantages and further implications of integrating AI in organisations for managerial functions.
3. To analyse the reasons for the gradual growth of AI in organisations and the ethical concerns related to the same.
4. To study the trajectory of growth of an organisation post adoption of AI and ground-breaking changes in technology.

Research Gap

There has been a strong observation that organisations, start-ups, enterprises, and big corporates are more inclusive in adopting artificial intelligence to help them assist in open up creative spaces in time structures for the employees. Although the growth of adoption has been moderately slow,

it is an indication of reluctant managers and top key personnel. Behind the inception of this research paper lies inquisitiveness and curiosity placed in the reasons of slow adoption of artificial intelligence in companies and organisation in the context of change management and span of control. There is a dearth of large scale research in the subjects of interconnectedness of technology, artificial intelligence, data science with management and businesses in a society, appropriately placed in the information age that is the 21st century.

Hypotheses

Following are the null as well as alternative hypotheses formulated for the purpose of this study:

H₀ – Organisations have not benefited from integration of disruptive technologies and AI for managerial functions.

H₁ – Organisations have benefited from integration of disruptive technologies and AI for managerial functions.

II. RESEARCH METHODOLOGY

The following research methods have been adopted:

1. The researcher has incorporated secondary research methods in the paper.
2. The researcher has also adopted descriptive and analytical research methods.
3. Articles from reputable management journals such as Harvard Business Review have been studied to carry forward a comprehensive analysis of the integration of artificial intelligence and management.
4. Various artificial intelligence technologies appropriate for managerial functions have been studied and analysed for the purpose of the study.
5. Application of principles of pure research methodology are to be subsumed, along with the aforementioned approaches.

Cognitive projects by type

We studied 152 cognitive technology projects and found that they fell into three categories.

Robotics & cognitive automation:	Cognitive insight:	Cognitive engagement:
71	57	24

Figure 1: Three Major Verticals of Automation Processes in Organisations

III. REVIEW OF LITERATURE

1. **Thomas Davenport et al (2017)**, in this research paper have applied empirical methods to come to conclusion about the reality of adoption of artificial intelligence and disruptive technology in organisations. “Automating frequent, data-intensive, tactical decisions can save a lot

of money,” said Thomas Davenport. He is a professor of information technology and management and a luminary in the field of research pertaining to disruptive technology as well as business management.

In Harvard Business Review’s “The Rise of Intelligent Automation”, it is highlighted that automation of managerial operations is not only inevitable but also necessary for competitive advantage.

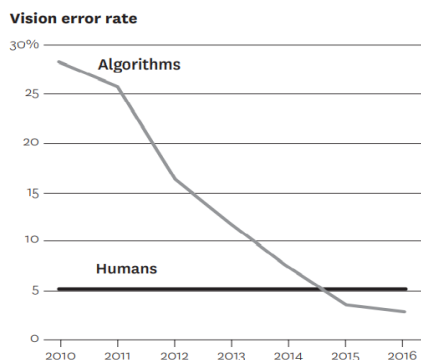
For the success of companies and organisations, the addition and adoption of artificial intelligence and automation to the internal and external operation as well functions of the company, said almost eight per cent of the participants of a survey conducted by Harvard Business Review Analytic Services.

Eighty-three per cent of the survey respondents expressed that they expect to increase efficiency and effectiveness by eliminating manual processes altogether, and seventy-four per cent responded that booting the performance of their operations and the process quality was a major objective and a final goal.

2. **Tim Fountaine et al (2018)**, in the Harvard Business Review article titled “Building the AI-powered Organization”, discuss the reasons and problems related to adoption of artificial intelligence. Organisations powered by AI are on the brink of a boom, and the watershed moment is almost here.

It was highlighted that McKinsey & Company, the global management consulting company, has estimated that companies with artificial intelligence will add \$13 trillion dollars to the economy. This article discusses the reasons for companies’ struggles to scale integration of artificial intelligence.

Machines have made real strides in distinguishing among similar-looking categories of images



Source: Electronic Frontier Foundation

Figure 2: Error Rate of Humans and Algorithms

Source: “Harvard Business Review – HBR’s 10 Must Reads on AI, Analytics, and The New Machine Age”

3. **M. Bensaou and Michael J. Earl (2019)**, in their article “The Right Mindset for Managing Information Technology” discuss the strategic importance of

information technology and the role of organisational management for the wide implementation of the same.

The researchers have listed five major problems with the technologies and the integration of same in various managerial functions. The authors of the article from the Harvard Business Review have drawn parallels between Japanese Management Methods and Western Management Methods with their respective treatment of technology and management.

The differences in the methods reveal that while Japanese use the instinctive methods to make technology and IT driven investments, western organisational philosophy is to align the developments with needs of the strategic decisions and operations. While westerners use the value for money ideology to define the validity of IT investments, eastern philosophy is to use of for improvement of organisational performance.

4. **Alan Kantrow (2020)**, in the article titled “The Strategy Technology Connection”, discuss the ever growing need for awareness amongst managers to change their managerial methodologies in the rapid technological growth. They have inevitably discovered and embraced that the use of disruptive technology and strategy is “inseparable”.

A comprehensive exploration of evolution of technology and management has been exhibited in the article. They highlight the nature of work as a transformation from active engagement to passive engagement, labelling it as “overseeing systems”, drawing from an analogy that belongs to manufacturing processes and jobs. Heavy light on data, information, and its role in modern management has been shown through the means of this informational article.

5. **Graham Kenny (2020)**, in the paper titled “Data is Great – But It Is Not A Replacement For Talking To Customers”, is an authoritative piece on strategy and performance measurement in the age of artificial intelligence and data oriented society. The author if this paper has emphasized on real engagement with customers rather than leaving to technological tools for customer engagement.

The author uses the example of Adobe and their culture of direct customer engagement, who have been a symbol of “culture of customer listening”. Adobe has come up with their own set of guidelines to help the company grow its culture. Several other examples of wealth management businesses and fintech businesses have also been explored in order to help the readers and other researchers explore the idea of human touch in customer engagement.

6. **Dorothy Leonard-Barton et al (2020)**, in their paper titled “Implementing New Technology”, have thoroughly discusses the opportunities with the growth of technology. In a major portion of their research, the authors have thoroughly explored the potential

challenges and risks of implement disruptive technology in organisations and managerial functions.

The “dual role” framework introduced in the paper has been thoroughly examined and applied to the use of technology in managerial functions. The rules that they have formulated are as follows:

“As a rule, one organization develops the technology and then hands it off to users, who are less technically skilled but quite knowledgeable about their own areas of application. In practice, however, the user organization is often not willing—or able—to take on responsibility for the technology at the point in its evolution at which the development group wants to hand it over.”

7. **Andrew McAfee (2021)**, in the paper titled “Mastering the Three Worlds of Information Technology”, have discussed the three main worlds of Information Technology and Disruptive Technology. The authors focus on building effective models to handle and integrate information technology in organisations.

The key takeaway from reviewing this literature was to encourage organisations to develop an effective customer relationship management model in order to execute a smooth transition from traditional methods to novel, technology-oriented models. “Economists and business historians agree that IT is the latest in a series of general-purpose technologies (GPTs), innovations so important that they cause jumps in an economy’s normal march of progress.” Therefore it is vital to have effective models in place to deal with transformative stages.

8. **Gary Hamel (2021)**, in the paper titled “The Why, What, and How of Management Innovation”, has focused on innovation in the managerial aspect of an organisational existence. The author starts by delineating the reasons for importance of innovation in management.

The paper further explores the different innovation cultures in different companies like Whole Foods, Toyota, and General Electric. The author encourage managers to “reinvent” the process of their operations and functions. The author has also listed down the necessary key changes required to make innovation and management a central topic, which includes product development and innovation, financial spending on innovative ideas in project management, on-boarding innovation mentors, etc.

9. **Zachary First (2021)**, in the paper titled “Technology Changes, Good Management Doesn’t”, starts by discussing the stark difference between the proposition of Moore’s Law and Peter Drucker’s traditional yet practical view on management. The difference symbolizes the difference of opinion in the use of technology as time progresses. The author here recognises that the capability of humans to change in an organisational setting is much rigorous and tough to implement. Therefore the author highlights the

collaborative effects of using technology with humans with the backdrop of the principles of augmentation. The effect of augmentation has a profound on impact on the productivity of an organisation.

10. **Lynda M. Applegate et al (2021)**, in their paper titled “Information Technology and Tomorrow’s Manager”, discuss the nature and the environment of the future of managerial personnel. The authors also focus on ethical and security issues posed by the use of technology in organisations. “Computerization of critical business processes may also create security risks. Sabotage, fraud, record falsification, and theft become more threatening than ever.” Therefore the authors conclude by mentioning that the transformation process will not be easy, however it will be inevitable and will proved organisations with competitive advantage.

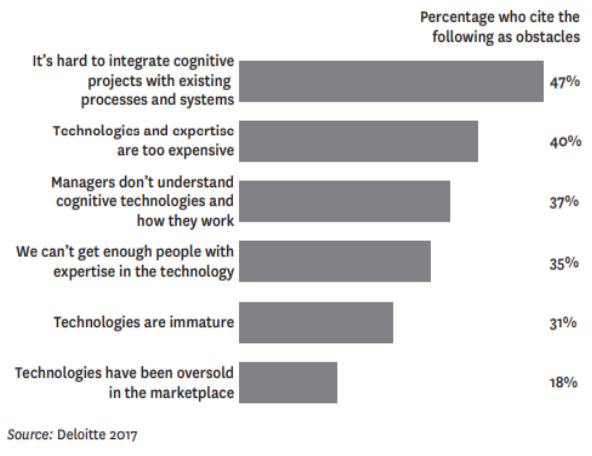


Figure 3: Percentage of Organisations with their Corresponding Response to Challenges in Integration of Disruptive Technology in The Organisations

Source: “Harvard Business Review – HBR’s 10 Must Reads on AI, Analytics, and The New Machine Age”

IV. FINDINGS AND SUGGESTIONS

A. Role of Artificial Intelligence and Scaling:

1. Katrina Lake and her project’s general idea includes incorporating data science in mass marketing techniques. In her experience as a consultant to retailers, she discovered how enormously data could create a better experience with apparel.
2. In an attempt to make Stich Fix Scalable, Lake came up with a plan involving data science which involved building the entire company’s algorithm around the clients and their needs. It basically worked on the principle of preferences at first. The whole revenue generated by the company was based on the recommendations from the algorithm.
3. The company’s data science algorithm not just helped in recommendations of clothing but also helped in keeping capital costs low, moving inventory and in efficient delivery.

- Apart from the above, Stitch Fix has benefited from machine learning to design apparel.

Supervised learning systems

As two pioneers in the field, Tom Mitchell and Michael I. Jordan, have noted, most of the recent progress in machine learning involves mapping from a set of inputs to a set of outputs. Some examples:

Input X	Output Y	Application
Voice recording	Transcript	Speech recognition
Historical market data	Future market data	Trading bots
Photograph	Caption	Image tagging
Drug chemical properties	Treatment efficacy	Pharma R&D
Store transaction details	Is the transaction fraudulent?	Fraud detection
Recipe ingredients	Customer reviews	Food recommendations
Purchase histories	Future purchase behavior	Customer retention
Car locations and speed	Traffic flow	Traffic lights
Faces	Names	Face recognition

Figure 4: Machine Learning Supervised Systems and Their Respective Application in Real World

B. Algorithms and Managers – The Relationship Reversed:

- The use of computer in the contemporary business plans have made a myriad of business operations much easier and have speeded up their process. The algorithms made for the company are hence computerized and automated.
- Algorithms make the work of prediction easier, but understanding the algorithm is of prime importance. The job of understanding this algorithm is of a manager specially recruited for the job.
- Algorithms are indispensable tools for planning the marketing strategies but at times not properly understanding them might lead to the company going off target, which is often the problem presented with such algorithms.
- Algorithms are extremely literal that is they do exactly what they are told to do which creates problems. Another reason why algorithms create problems is because they are "black boxes" that is they do not explain why they make particular recommendations.
- Recognising these two limitations of algorithms is the first step to understanding them better.
- The best way to mitigate problems related to the algorithms is to be crystal clear about what the company wants to achieve.
- Algorithms tend to be myopic that is they focus on data presented at hand that often pertains to short term goals, the myopic nature of the algorithm needs to be reduced. This can be solved while setting the objective of the company by focusing on long term goals rather than focusing on short term goals.

- The data input of the algorithm has to be carefully chosen from amongst a large information presented, for the algorithm to work properly and give the desired goals.

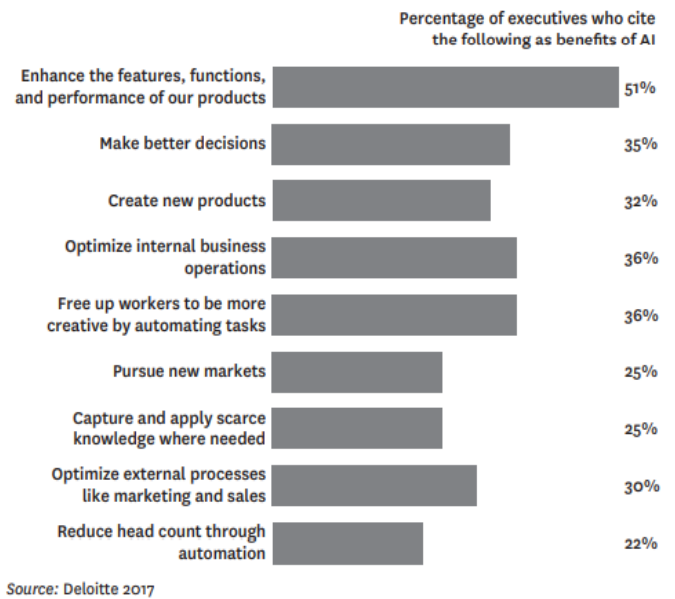


Figure 5: Benefits of Using Artificial Intelligence as Mentioned by Organisations, in Percentage

C. Artificial Intelligence and Marketing –

- Technologies like Alexa, Siri, etc simplify our lives in many ways. They are also used in the marketing industry for many purposes like Alexa is used to discover opportunities to grow traffic, leads, revenues and business. Alexa basically guides the company on how to sell its products to the consumers and how to meet their expectations.
- Over the next few years, most of the multinational companies will establish their own preferred consumer Artificial Intelligence platform. These AI assistants will modify how the companies communicate with their customers.
- They will be requisites for consumers to acquire the information, goods and services hence marketing will primarily depend on such platforms. AI will help consumers navigate their increasingly overwhelming choices to the marketing firms.
- People purchase from an array of choices available to them, choosing from amongst uncountable options. This can be a time consuming and tedious process, this problem can be solved by introducing AI assistants.
- The AI assistants will not only reduce the costs of purchasing but also exceptional advantages.
- They will guarantee the continuous flow of routine purchases to households. The more the consumers use a platform, the better will the platform will understand their habits and preferences, and better

it will meet their needs increasing their satisfaction in a self-reinforcing cycle.

- In future, the firms will pivot their attention of their marketing from the costumers or consumers to the AI platforms.

How AI platforms create value

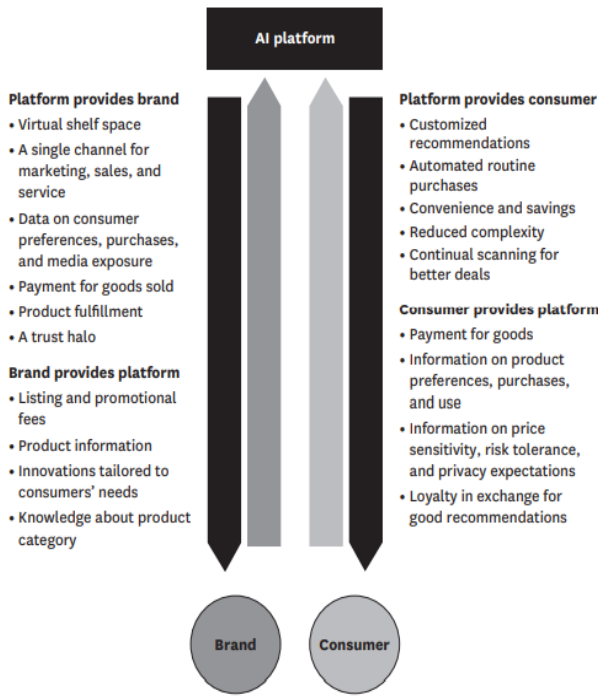


Figure 6: Value Creation with the Use of Artificial Intelligence Platforms

D. Artificial Intelligence, Augmented Reality, and The Much Needed Actions –

- While working on data available, companies are presented with a problem which is that the information collected by it on screens and pages is two dimensional , while it has to be applied to the physical world which in three dimensional. This creates a barrier between the two which can only be solved by coming up with an Augmented Reality Strategy.
- Augmented Reality Strategy is a set of technologies which overlays the digital data on the image of the physical world. In the coming years, it will transform how we learn , make decision and interact with the physical world. AR acts by directly putting information into the context in which we will apply it.
- AR will affect how enterprises will serve customers, train employees, design and create products, manage their chain values and ultimately how the companies will compete . AR is an interface between people and machines hence it is

important for firms to come up with augmented reality strategies.

How foundational technologies take hold

The adoption of foundational technologies typically happens in four phases. Each phase is defined by the novelty of the applications and the complexity of the coordination efforts needed to make them workable. Applications low in novelty and complexity gain acceptance first. Applications high in novelty and complexity take decades to evolve but can transform the economy. TCP/IP technology, introduced on ARPAnet in 1972, has already reached the transformation phase, but blockchain applications (in white) are in their early days.

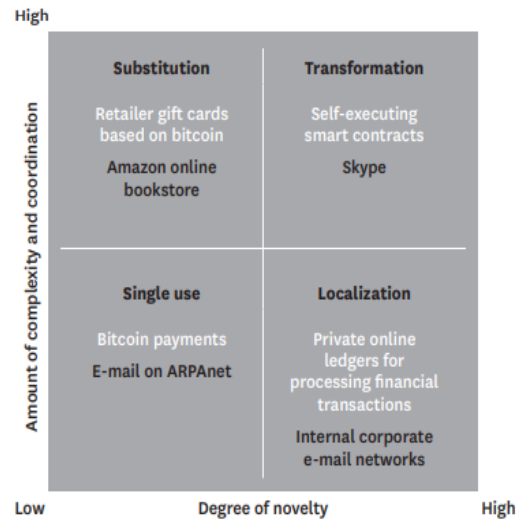


Figure 7: The Four Stages of Establishment for Foundational Technologies

V. SIGNIFICANCE OF THE STUDY

This study is significant for further research in the area of management, its functional scope and integration with artificial intelligence and disruptive technology. The research paper attempts to explore the gap in the current research and presents answers to some of the most important questions in the organisational setting. The purpose of this study is to pave way for more research studies on the integration of disruptive businesses and technologies in the research scope in order to shed light on the innovation trends in management as well as I business organisational management.

VI. LIMITATIONS OF THE STUDY

Primary data sources have not been taken into consideration during the course of this research. The information presented in the research paper has been cited from secondary data sources like books, journals, websites, newspaper articles, etc. which may serve as a limitation to the research. Inadequate resources as well as time constraints are included in the set of factors contributing to restricted effects of this research. The study has also been impeded by researcher's inability to cover the scope of the topic.

VII. CONCLUSION

While there is an unexpected high rise in the use of technology in almost all aspects of businesses and there is an undeniable use of technology even in society today, business organisations had been hesitant to introduce the disruptive technology in their organisation. The inevitability of penetration of technology in the society has also led to immense changes in the business and organisational scenario.

Artificial intelligence and machine learning are now making it possible to give the reins to technology in order to make data-driven, accurate, and effective decisions when it comes to organisational functions. The enablers of Artificial Intelligence, such as developmental platforms, cloud computing technology, and high data processing as well as data storage technologies, are growing in a rapid fashion in the organisational setting.

According to a study, it was estimated that disruptive technology and artificial intelligence will add \$13 trillion to the economy. Therefore the age of information, data, and artificial intelligence is inevitable.

“AI is now guiding decisions on everything from crop harvests to bank loans, and once pie-in-the-sky prospects such as totally automated customer service are on the horizon.” The aforementioned quote rightly summarizes the scope of this research. It also rightly highlights the idea encapsulated in the research study.

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